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MOREAU (C.) & MOREAU (MIREILLE). **Note préliminaire sur quelques maladies des Quinquinas à Madagascar.** [A preliminary note on some *Cinchona* diseases in Madagascar.]—*Mém. Inst. sci. Madagascar*, Sér. B, 2, 2, pp. 159–160, 1949 (published 1950).

Cultural studies in Paris on diseased *Cinchona succirubra* material received from Madagascar, which had already been studied by Professor R. Heim in 1935, established that three serious diseases were present. Several young trees were attacked at the collar by a fungus invading the tissues and rapidly causing wilting and death of the tree. The abundant white mycelium of a basidiomycete, the clamp-connexions of which indicated an affiliation with the Aphyllophorales, was isolated from beneath the bark of severely affected trees, and *Fusarium javanicum* from the roots and collar bark, the ascigerous state of which (*Hypomyces ipomoeae*) [*R.A.M.*, 28, p. 40] developed on diseased trunk fragments maintained in a humidity chamber.

Lasiodiplodia [*Botryodiplodia*] *theobromae* [ibid., 30, p. 181], a very common and ubiquitous fungus, caused a rot of the declining upper branches of some trees, the pith of which was invaded by a brown mycelium. In the authors' opinion *Diplodia cinchonae*, reported on branches of *C. succirubra* in Java [ibid., 11, p. 131], should be considered a synonym of *B. theobromae*.

Several trunk fragments with localized desiccation and cracked swellings [ibid., 9, p. 616], yielded a *Pestalotia* sp. This fungus is fairly widespread throughout Madagascar and was isolated from the leaves of *C. ledgeriana* from the same locality.

Of these diseases the first mentioned is the most serious and the burning of affected parts is recommended. Good cultural practices and constant surveillance are needed to avoid contamination.

BAKSHI (B. K.). **Development of perithecia and reproductive structures in two species of Ceratocystis.**—*Ann. Bot., Lond.*, N.S., 15, 57, pp. 53–61, 1 pl., 4 figs., 1951.

A description is given of the characteristics and reproductive morphology of *Ceratocystis piceae* [*R.A.M.*, 29, p. 509] and *C. autographa* n.sp., the latter isolated during 1946 to 1947 from galleries of the bark beetles *Hylurgops palliatus* and *Dryocoetes autographus* in Japanese larch (*Larix leptolepis*) growing at Blair Atholl, Scotland.

CUMMINS (G. B.) & LING (L.). **An index of the plant rusts recorded for Continental China and Manchuria.**—*Plant Dis. Reptr, Suppl.* 196, pp. 520–556, 1950. [Multilithed.]

The index is primarily a compilation of published records of Chinese rusts for which Part III of F. L. Tai's list [*R.A.M.*, 16, p. 840] served as a basis. Forty-five references are given in addition to those cited by Tai. Host and rust species are arranged alphabetically in a single list. There are few annotations as few collections were available for study.

THIRUMALACHAR (M. J.) & NARASIMHAN (M. J.). **Alternation of generations and heteroecism in Puccinia versicolor.**—*Ann. Bot., Lond.*, N.S., 14, 55, pp. 341–345, 1 pl., 1 fig., 1950.

This is a full account of work already noticed from another source [*R.A.M.*, 28, p. 576].

ALEEM (A. A.). **Phycomycètes marins parasites de Diatomées et d'Algues.** [Marine Phycomycetes parasitic on Diatomaceae and Algae.]—*C.R. Acad. Sci., Paris*, 231, 15, pp. 713–715, 4 figs., 1950.

An account is given of some lower phycomycetes parasitizing marine algae and diatoms in the vicinity of Banyuls-sur-Mer (Pyrénées-Orientales, France) [cf. next abstract]. Infestation is sometimes so severe as to cause the rapid disappearance of the host from the locality.

EMERSON (R.). **Current trends of experimental research on the aquatic Phycomycetes.**—*Ann. Rev. Microbiol.*, 4, pp. 169–200, 1950.

The author reviews the literature (88 titles) of the last ten or twelve years dealing with the aquatic phycomycetes in an attempt to examine and integrate certain recent trends in the study of these organisms [cf. *R.A.M.*, 14, p. 59; 22, p. 327, and preceding abstract], the chief aspects covered being the use of pure cultures, nutrition and metabolism, germination of resting spores, sexuality, life-cycles and nuclear cytology, genetics and cytogenetics, and experimental taxonomy.

USCHDRAWEIT (H. A.). **Boden und Viruserkrankungen. Ein Beitrag zur Epidemiologie der Virosen.** [Soil and virus diseases. A contribution to the epidemiology of the viroses.]—*Z. PflKrankh.*, 56, 7–9, pp. 252–256, 1949.

The large-scale cultivation of tobacco along the east coast of Sumatra affords unique possibilities for the study of virus epidemiology in relation to environmental factors. The present contribution represents an attempt to correlate the occurrence of virus diseases with soil types.

The principal local virus is undoubtedly that of tobacco mosaic. The first chlorotic symptoms are already apparent in the seed-bed. At this stage the disease is known locally as 'peh-sim', meaning 'pale heart' [*R.A.M.*, 11, p. 478]. Its early development is attributable to infection contracted through handling at transplanting time [cf. ibid., 30, p. 21], about 20 days after sowing. There is further a constant risk of infection from the handling of the leaves in the search for lepidopterous eggs and caterpillars. An epiphytotic may normally be expected about the 30th day after sowing, allowing for an 11-day incubation period. Plucking undoubtedly entails the gravest danger of infection, and about three weeks after its inception practically the whole plantation is contaminated. In the most favourable cases the symptoms are confined to the uppermost, less valuable leaves or even to the lateral shoots. However, an early start of infection generally leads to severe deterioration in the quality of the leaf and may even prevent its use.

After the previous tobacco crop the ground was planted with dry rice followed by *Mimosa invisa*, in both of which crops tree seedlings were allowed to develop. A minimum period of six years then elapsed before replanting with tobacco. It is unlikely that either 'wild' tobacco or the numerous Solanaceae in the rising forest harboured the virus, which may, however, possibly have survived in the soil on remnants of tobacco stems which escaped burning over. Its longevity in smoking and chewing tobacco appears to be virtually unlimited, while chilli fruits, a staple article of the local diet, are another potential source of infection. A promising control measure is the disinfection of the coolies' hands and implements with 8 per cent. trisodium phosphate plus 4 per cent. sodium soap [ibid., 29, p. 125].

The dependence of tobacco mosaic virus on soil type was observed by Hunger as early as 1901 to 1905 (cited by H. Jensen in *Meded. Proefst. vorstenl. Tab.* 40, [p. 47, 1921]). Of the two main recent volcanic types used for tobacco cultivation, namely, the grey to white, alluvial sandy clays of the coastal zone and the residuary red, brown-red, or black weathered soils of the higher altitudes, the former produced heavily infected and the latter almost completely healthy crops. Another virus disease predominating on alluvial soils is Rotterdam B [*R.A.M.*, 19, p. 241]. One of the several forms of 'kroepoek' [tomato spotted wilt: ibid., 11, p. 478], known as 'pseudo peh-sim' [ibid., 21, p. 473], had long been prevalent on these soils in a mild form, but in 1938 a violent outbreak, involving the bulk of the plants (roughly 1,000,000) in a section, caused such heavy damage as to preclude the utilization of any but the foot leaves.

Yoshida (T.) & Suda (S.). **An inactivator in the juice of Phytolacca americana for the Tobacco mosaic virus I.**—*Science* (*Japan*), 17, p. 58, 1947. [Abs. in *Chem. Abstr.*, 45, 3, p. 1208, 1951.]

In experiments at Tôhoku University, Japan, tobacco mosaic virus was inactivated by the dried precipitate from a filtered extract of minced fresh *Phytolacca americana* [*P. decandra*: *R.A.M.*, 27, p. 508] leaves at 0·003 per cent., which had a positive saponin reaction and lost its activity after 20 minutes' heating at 90° to 92° C.

Fulton (R. W.). **Bacteriophages attacking Pseudomonas tabaci and P. angulatum.**—*Phytopathology*, 40, 10, pp. 936–949, 4 figs., 1950.

At the Wisconsin Agricultural Experiment Station two bacteriophages attacking both *Pseudomonas tabacum* and *P. angulata* were isolated from wildfire- and blackfire-diseased tobacco [cf. *R.A.M.*, 6, p. 645; 14, p. 154]. The thermal inactivation point of phage 1 was 66° C. and that of phage 2, 56°, and the stability of the former was maintained over a wider pH range (4·5 to 10·5 as compared with 5 to 10). Electron micrographs of phage 1 revealed characteristic tailed particles, whereas phage 2 appeared as circular or slightly irregular particles without tails. Each phage induced lysis of strains of bacteria resistant to the other [cf. ibid., 30, p. 218].

On some isolates of the bacterial host, phage 1 killed the cells but failed to multiply. An excess of phage 2 led to the production by many bacterial isolates of abnormally flat, translucent colonies, which were lysogenic but readily gave rise to normal, phage-free colonies on replanting. Besides the two tobacco pathogens, *P. lacrymans* proved to be susceptible to phage 1 and *P. coronafaciens*, *P.* [*medicaginis* f. sp.] *phaseolicola*, and *P. syringae* to phage 2.

Both phages were inactivated by dilution in solutions containing monovalent cations. Inactivation was prevented by low concentrations of divalent cations. Electron micrographs of phage 1 inactivated by potassium chloride showed flattened particles with many of the heads and tails separated.

One or both phages were isolated from nearly half the field collections of wildfire and blackfire material. That from heavily infected fields yielded phage more frequently than that from lightly diseased. Spraying tobacco seedlings with undiluted filtrates of the phages lowered the incidence of infection resulting from subsequent inoculation with *P. tabacum*, the maximum reductions (from 100 to 39 per cent. in the field and from 97 to 16 in the greenhouse) being obtained with a mixture of the two phages. Six out of 25 isolates of *P. tabacum* from field material were resistant to phage 1 and five to phage 2. None of the 20 isolates of *P. angulata* was resistant to either phage.

It was concluded that the bacteriophages might reduce the spread of disease from severely infected foliage, but that they were probably not a major factor in the arrest of initial infection.

WILHELM (S.). **The inoculum potential of Verticillium albo-atrum as affected by soil amendments.**—Abs. in *Phytopathology*, 40, 10, p. 970, 1950.

The effect on the inoculum potential of *Verticillium albo-atrum* produced by the addition of various amendments to field-infested soil in pot tests [in California: see below, p. 332] was evaluated by determining the tomato infection index in amended and untreated portions of the same soil. Substantial reductions in the inoculum potential of the pathogen resulted from the use of 1 per cent. of the air-dry weight of the soil of blood meal, fish meal, ammonium sulphate (½ per cent.), chopped lucerne hay, barley straw, and cottonseed meal, listed in decreasing order of efficiency. Applications at 1/10 did not appreciably lower the inoculum potential, but fermate and dithane Z-78 at 0·1 and 0·01 per cent. effected a considerable reduction. With some of the materials an eight-week decomposition period gave a larger reduction in inoculum potential than did shorter periods.

BROCK (R. D.). **A search for resistance to defoliation by Alternaria solani in the genus Lycopersicon.**—*J. Aust. Inst. agric. Sci.*, 16, 3, pp. 90–94, 1950.

In experiments carried out at Canberra the following method was developed for determining the inherent reaction of tomato plants to artificial inoculation with *Alternaria solani* [*R.A.M.*, 29, p. 233]. Sixty tomato seedlings in flats 2 ft. by 1 ft. were sprayed with 100 ml. of a mycelial suspension prepared from a macerated fungus mat grown in 100 ml. Tochinai's solution [ibid., 19, p. 170] for 14 days at 27° C. Subsequent disease development was satisfactory when the plants were held at 90 to 100 per cent. relative humidity for three days at mean temperatures ranging from 19·1° to 28·5° and then removed to the greenhouse for another three days. The rating was based primarily on defoliation and ranged from 0 (no infection) to 10 (total defoliation and terminal bud killed) taking into account the number of expanded leaves.

Field isolates of *A. solani* from tomato, potato, and *Solanum nigrum* varied in pathogenicity on tomatoes and potatoes, and monospore isolates proved them to be a mixture of strains. Two of these mixtures proved consistently more pathogenic to tomatoes and one to potatoes. Cross inoculation tests showed that pathogenicity on either host was not affected by passage through the other host.

Under the conditions of the test no resistance to defoliation by *A. solani* was located in 109 commercial varieties, *Lycopersicon esculentum* var. *cerasiforme* (a native tomato from New Guinea), 17 lines of *L. pimpinellifolium*, 20 of *L. peruvianum*, *L. p.* var. *dentatum*, or two lines of *L. hirsutum*. From these results and field observations the field reaction to the disease appears to be a combination of the inherent plant reaction and the growth habit which exerts its effect on the micro-environment of the leaves. Plants producing dense bushy growth provide a more favourable micro-environment for disease development than the open, spreading type.

HENDRIX (J. W.). **A Phomopsis disease of Tomatoes in Hawaii.**—Abs. in *Phytopathology*, 40, 10, p. 966, 1950.

In a 1947 winter planting of Pearl Harbor tomato, several line hybrids, and assorted varieties in North Oahu, Hawaii, the stems of the older plants bore many lesions, which in the case of a subsequent planting were accompanied by mummified fruits. The species of *Phomopsis* [cf. *R.A.M.*, 19, p. 170; 25, p. 368] isolated from the lesions was found to be seed-borne and partially systemic; it grew best on potato dextrose agar between 28° and 32° C. The lesions develop almost exclusively round the petiole bases and measure up to 60 by 5 to 30 mm. They consist of concentric rings, 1 to 2 mm. apart, and seldom girdle or kill the plants. The fungus sporulates profusely on petiole remnants and fruits, up to 30 of which, in a mummified condition, have been counted on individual plants.

Florenzano (G.). **Una specie di Valsa nuova per l'Italia.** [A species of *Valsa* new to Italy.]—Reprinted from *Nuovo G. bot. ital.*, N.S., 56, 4, 6 pp., 2 figs., 1949. [Received November, 1950.]

Further studies on the fungus causing wilt of poplars near Pisa [cf. *R.A.M.*, 26, p. 271] have shown the conidial state to be *Cytospora chrysosperma* and the perfect state *Valsa sordida* [ibid., 10, pp. 349, 418; 28, p. 94], a fungus new to Italy.

Ter Pelkwijk (A. J.) & Brink (G.). **Verslag van het onderzoek 1943–1945 en 1946 naar den Populierenkanker.** [Report on the Poplar canker investigation 1943–1945 and 1946.]—*Meded. ned. Heidemaatsch.* 2, 21 pp., 6 figs., 2 graphs, [? 1947. English summary. Received February, 1951.]

During the period from 1937 to 1942 no inoculation experiments with *Pseudomonas rimifaciens*, the supposed agent of poplar canker in Holland [*R.A.M.*, 28, p. 316], were performed before May owing to the absence of bacterial exudate. June inoculations still gave strongly positive results. In 1943, however, the trees were highly susceptible in May but reacted negatively in June, while in 1944 and 1945 the May tests were evidently too late. It would thus appear that susceptibility to the disease in the spring is closely correlated with the temperature during the preceding winter. For instance, the rigorous winters of 1939 to 1942, inclusive, were followed by periods of susceptibility in May and June, whereas the mild conditions prevailing from 1943 to 1945 induced an advance to April or possibly March.

Research on sources of resistance to poplar canker have been in progress since 1938. During the period from 1943 to 1945 *Populus nigra* and its vars. *italica* and *betulifolia* were classed as resistant.

Dothichiza populea [loc. cit.] may cause severe damage under certain conditions, being favoured, for instance, by frost in May. In 1944 four- to five-year-old experimental specimens of *P. robusta*, *P. angulata* var. *erecta*, *P. simonii* var. *fastigiata*, *P. berolinensis*, *P. gelrica*, and *P. marilandica* were attacked, in addition to a number of newly transplanted seedlings, which appear to be particularly susceptible. In 1946, when the pathogen assumed a virulent form, *P. deltoides* var. *missouriensis* and *P. nigra* var. *italica* contracted severe infection.

Brink (G.). **Verslag van bet onderzoek naar de Populierenkanker in 1947.** [Report on the Poplar canker investigation in 1947.]—*Meded. ned. Heidemaatsch.* 8, 10 pp., 3 figs., 1949. [English summary. Received February, 1951.]

An abnormally warm, dry summer following an exceptionally severe winter may have been responsible for the failure of most of the inoculations performed on poplars in 1947 with crude exudate of *Pseudomonas rimifaciens* [see preceding abstract]. Cankers developed only in the most susceptible species, *Populus brabantica*, inoculated in May. Cankers formed in 1946, moreover, made little further growth or showed a tendency to regression. A high degree of resistance characterized hybrids in which *P. nigra*, its var. *italica*, or *P. marilandica* [*R.A.M.*, 29, p. 282] served as one of the parents.

Isolations from diseased tissues and bacterial exudate yielded many species of bacteria, one of which (distinct from *Pseudomonas rimifaciens*) was slightly pathogenic to *Populus candicans*. On one occasion the tissues also yielded fungi (*Fusarium neoceras*, *Macrosporium commune* [*Pleospora herbarum*], and yeasts). It is concluded that the identity of the causal organism of the canker has not yet been demonstrated.

Swingle (R. V.) & Bretz (T. W.). **Zonate canker, a virus disease of American Elm.** *Phytopathology*, 40, 11, pp. 1018–1022, 2 figs., 1950.

In 1941 an exceptionally severe case of elm mosaic [*R.A.M.*, 23, p. 244] occurred

on an American elm (*Ulmus americana*) at Lawrenceville, New Jersey. Bark patches from the diseased tree were grafted to nursery elms about five years old and in the following early spring two of the grafted trees developed mottling and necrotic leaf spots followed by small, necrotic bark cankers in the upper stems and branches in late summer. The cankers enlarged and extended into the cambium region, sometimes girdling the affected branches and killing their terminal portions. Light and dark brown zones or concentric rings occurred in the necrotic bark tissue beneath the surface of larger cankered areas. In the spring of 1943 bark patches were grafted to the lower stems of three healthy nursery elms, the tops of which were severely pruned. Typical symptoms developed on two of the trees and they died the same autumn. In 1947 zonate canker and mild to severe mottle and rugose mosaic developed in nursery trees grafted with bark patches from apparently healthy elms at Marietta, Ohio. No cankers developed below the point of grafting, but leaves on epicormic branches from below the graft frequently bore necrotic spots about 2 cm. in diameter, which sometimes coalesced to involve a large portion of the leaf. In June, 1948, bark patch grafting from an American elm tree at Columbia, Missouri, exhibiting necrotic leaf spots, to healthy trees resulted in typical zonate canker symptoms.

In transmission experiments carried out in June, 1948, bark patches from the margins of zonate cankers on six trees were grafted to the lower stems of 17 healthy elms, the tops of which and of ungrafted controls were severely pruned ten days later. The first symptoms of zonate canker appeared at the end of July. By November, 1949, eight of the grafted trees had developed zonate cankers around the points of grafting and on their upper stems and branches. When thin slices of bark from zonate cankers were placed in stem wounds extending into the wood of three healthy elms all developed symptoms of the disease. Diseased bark patches fixed on exposed phloem tissue on the stems of four healthy trees induced zonate cankers in three of the trees.

The disease, which was also observed at Columbia, Missouri, is apparently of virus nature, and may occur alone or in combination with the elm mosaic; both viruses are latent in large shade-tree elms.

Shafer (Thelma) & Liming (O. N.). **Ceratostomella ulmi types in relation to development and identification of perithecia.**—*Phytopathology*, 40, 11, pp. 1035–1042, 1950.

This is a full account of studies on the production of perithecia by mass isolates of *Ceratostomella ulmi*, a preliminary abstract of which has already been noticed [*R.A.M.*, 29, p. 441]. The first records of naturally occurring perithecia in the United States were in 1947 and 1948 on wood and bark from two elm trees in New Jersey and one in Colorado.

The 53 isolates tested on elm discs on moistened filter paper in Petri dishes were classed as types A, Ab, AB, aB, or B. Thirty-six were monosexual (A and B) [loc. cit.], eight (Ab) usually produced perithecia when paired with type B isolates, but some also developed occasional perithecia when paired with nine of the A isolates. Four (type aB) produced perithecia with most of the A isolates, but also with five of B. Five appeared to be definitely bisexual (AB), but were inconsistent.

Type A isolates were the most frequently encountered in most of the Dutch elm disease areas and were well distributed geographically. Type B and all but one of aB were from the Indianapolis area, Indiana [loc. cit.]. The AB and Ab isolates were not restricted geographically.

Spore masses from single perithecia produced by pairing, when transferred to elm wood, produced perithecia in about three-quarters of the plates. When such transfers were paired with type A or type B, perithecia were produced consistently. Although type B isolates tended to be atypical they could not be definitely

distinguished macroscopically from type A isolates, but could be separated on the sizes of their conidia, the average of the former being 4·9 by 3 μ, the latter 3·6 by 1·7 μ.

Pairing on elm wood of *C. ulmi* with five similar elm-inhabiting fungi gave no evidence that these fungi contributed to the production of *C. ulmi* perithecia.

WEBSTER (C. C.), WIEHE (P. O.), & SMEE (C.). **The cultivation of the Tung Oil tree (Aleurites montana) in Nyasaland.**—48 pp., 6 figs., Zomba, Nyasaland, Government Printer, 1950. 5*s*.

In the section entitled 'Notes on three diseases of Tung in Nyasaland' by P. O. WIEHE (pp. 37–41), die-back is stated to be caused by *Botryosphaeria* (?) *ribis* [*R.A.M.*, 29, p. 339]. The same fungus has been isolated from sun scorch lesions which are common on young budded and top-worked trees. Methods for the prevention of sun scorch are being developed [cf. ibid., 30, p. 4]. In controlling *Armillaria mellea* root rot [ibid., 28, p. 200] it was found that ring-barking must be done at least two years before the proposed date of planting.

RISHBETH (J.). **Observations on the biology of Fomes annosus, with particular reference to East Anglian Pine plantations. I. The outbreaks of disease and ecological status of the fungus. II. Spore production, stump infection, and saprophytic activity in stumps.**—*Ann. Bot., Lond., N.S.*, 14, 55, pp. 365–383, 1950; 15, 57, pp. 1–21, 3 pl., 1 diag., 1951.

In this full account of work in East Anglia on *Fomes annosus*, the agent of a serious root disease of conifers [*R.A.M.*, 28, p. 654], a summary is given of existing information. The fungus occurred in some East Anglian plantations on stumps and trees of Scots pine, *Pinus nigra* var. *calabrica*, *Pseudotsuga taxifolia*, larch, and spruce. It was seen on *Crataegus monogyna*, *Pteridium aquilinum*, and young *Chamaecyparis lawsoniana*, and was isolated from dying roots of oak, beech, and *Populus italica*. Symptoms include growth retardation of the crown, dwarfed needles, and gum exudation from the roots. Limited growth was obtained on cultured soil samples from depths of 8 and 15 to 30 cm. The fungus grew well on the surface of unsterilized pine roots from a plantation on former chalk grassland, but poorly on roots taken from one on former *Calluna* heath. An account is given of the interaction in culture of *F. annosus* with strains of *Trichoderma viride* [see above, p. 287], many of which are antagonistic to the former. The presence of *F. annosus* in wood may be diagnosed readily by keeping samples in wet paper at room temperature. Abundant production of conidia occurs after four to five days on non-resinous wood and eight to ten days on resinous. Conidia are also produced abundantly in culture, but rarely under natural conditions. Sporophores are formed on stumps and dying trees throughout the year provided that the humidity is sufficiently high. Spore discharge also may occur at any time during the year even at low temperatures, ceasing only when the sporophores freeze or during very dry weather. In the laboratory the basidiospores germinated at relative humidities above 92 per cent. on freshly cut, unsterilized pine wood. Viability was lost rapidly in the light at temperatures above 15° C. There is evidence that spores washed down into the soil remain viable for a short while at least and that stumps covered by soil are infected from this source. When stumps were inoculated with a mixed suspension of *F. annosus* and *Peniophora gigantea*, the former colonized the wood at first but was soon replaced by *P. gigantea*. The incidence of natural infection in stumps and the factors affecting it, competition of *F. annosus* with other fungi during stump colonization, and the probably course of succession in stumps rotted by the fungus are discussed.

Orłoś (H.). **Grzyby szkodliwe w budynkach i na składach drewna.** [Harmful fungi in buildings and timber depots.]—*Wydaw. pomocn. tech.-gosp.* (Ser. B), *Inst. Bad. Leśn.* 24, 76 pp., 1950. [Abs. in *For. Abstr.*, 12, 2, p. 192, 1950.]

Written mainly for sawmill staff, this book deals with the most important species of fungi attacking houses and timber depots, as well as those causing blue stain, and describes their control by the use of various fungicides.

Gottlieb (S.), Day (W. C.), & Pelczar (M. J.). **The biological degradation of lignin. II. The adaptation of white-rot fungi to growth on lignin media.**—*Phytopathology*, 40, 10, pp. 926–935, 3 figs., 1950.

In further studies at the University of Maryland [cf. *R.A.M.*, 29, pp. 393, 596] the white rot fungi *Poria subacida* and *Polyporus* [*Polystictus*] *abietinus* growing in synthetic media utilized lignin only after a process of adaptation, which simultaneously adjusts them to development on many different kinds of lignin and lignin-containing residues. The adaptation, therefore, is not specific for the isolated native lignin used in the adaptive procedures. A synergistic effect on the growth of all three fungi resulted from the inclusion of both glucose and lignin in the substratum.

Papazian (H. P.). **A convenient method of growing fruiting-bodies of a bracket fungus.**—*Bot. Gaz.*, 112, 1, p. 138, 2 figs., 1950.

In the course of work carried out in the Department of Botany, University of Chicago, fruiting bodies of *Schizophyllum* spp. were regularly obtained in culture in 6-in. glass-capped test tubes filled with vermiculite saturated by any 5 per cent. nutrient solution, and inoculated on top of the medium with cubes from agar cultures. The tubes were then incubated at room temperature in a vertical position until a good growth of mycelium had covered the surface of the vermiculite and grown about ½ in. down the tube. Fruiting was then induced by placing the uncapped tubes in hollow, porous, soft tiles placed in a water-tight tray with the holes running horizontally. The tubes are inclined in the holes with the open ends towards the light. The tiles must be kept continuously moist. Growth of moulds or bacteria is prevented by dissolving copper sulphate in the water. Sporophores grow out within one to five weeks.

Schulze (B.). **Neue Schutz- und Bekämpfungsmittel gegen holzzerstörende Insekten und Pilze II. Grundlage: Hydrogenfluoride.** [New protection and control preparations against wood-destroying insects and fungi II. Basis: hydrogen fluoride]—*Holzforschung*, 3, 2, pp. 32–47; 4, pp. 97–117, 2 figs., 1 diag., 6 graphs, 1949.

The information relating to fungi in this study [see next abstract] may be summarized as follows. The preparations IPF_{90} (potassium hydrogen fluoride), IP_{46} (ammonium hydrogen fluoride), and IP_{82} (a mixture of the latter with alkali (mono) fluoride) (IPF = insects, fungi, and fire) were tested by the wood block method for their action on five wood-destroying fungi at 20 to 65 per cent. relative humidity [*R.A.M.*, 29, p. 595]. At the end of three months the *doses toxicae* of IPF_{90}, expressed as (*a*) percentages of the content of the preservative solution and (*b*) in kg. of the preparation per cu. m. wood, were as follows: *Coniophora cerebella* [*C. puteana*] 0·05 to 0·075 and 0·31 to 0·458, respectively; *Poria vaporaria* 0·05 to 0·075 and 0·365 to 0·532; and *P. contigua* [*R.A.M.*, 29, p. 392] 0·1 to 0·2 and 0·58 to 1·26. After four months the corresponding values for *Lenzites abietina* and *Lentinus lepideus* were 0·075 to 0·1 and 0·465 to 0·611, and 0·0075 to 0·01 and 0·465 to 0·63. The corresponding IP_{46} values for *C. puteana* were 0·075 to 0·1 and 0·532 to 0·72; *P. vaporaria* 0·05 to 0·075 and 0·355 to 0·532; *P. contigua* 0·1 to 0·15 and

0·71 to 1·05; and for *L. abietina* 0·075 to 0·1 and 0·532 to 0·73; and for IP_{82} on *C. puteana* 0·1 to 0·15 and 0·7 to 1·05; *P. contigua* 0·15 to 0·2 and 1·06 to 1·38; *L. abietina* 0·1 to 0·15 and 0·7 to 1·02; and *Lentinus lepideus* 0·0075 to 0·01 and 0·0548 to 0·071.

In experiments with the same substances against [unspecified] aerial mould contaminants, the following values, expressed as in the foregoing series, were obtained: IPF_{90} 0·3 to 0·5 and 1·92 to 3·35, respectively; IP_{82} 0·5 to 1 and 3·1 to 6·1; and IP_{46} 0·75 to 1 and 5·1 to 6·6.

In the second paper the *doses toxicae* of osmol WB_4 (alkali hydrogen fluorides plus organic adjuvants and a wetter) are given as follows: *C. puteana* 0·1 to 0·15 and 0·66 to 0·99, respectively; *P. vaporaria* 0·05 to 0·075 and 0·34 to 0·51; *P. contigua* 0·075 to 0·1 and 0·458 to 0·62; and *Lenzites abietina* 0·1 to 0·15 and 0·67 to 1·04. The values in the mould test were 0·3 and 0·5 and 2·46 to 3·1.

Schulze (B.). **Gesteigerter Holzschutz durch Beachtung des Eindringens der Schutzmittel.** [Enhanced wood protection through attention to the penetration of preservatives.]—*Bauplan. u. Bautech.*, 2, 12, pp. 353–358, 5 figs., 2 diags., 5 graphs, 1948. [Received October, 1950.]

From extensive studies on the penetrability of timber preservatives the author concludes that oils and oily liquids applied without pressure are not incorporated into the body of green wood, whereas wood of a moisture content not exceeding 28 per cent. can safely be treated with preservatives of this type. In the case of aqueous solutions, the more dilute penetrate farther into dry and air-dry wood than the concentrated, whereas green wood is more deeply penetrated by the latter. Wherever practicable the temperature of the preservative in the immersion tank should alternate, e.g., four hours at 80° C. followed by three at 20°. Impregnation by the osmotic process [*R.A.M.*, 15, p. 546 *et passim*], using osmol WB_4 [see preceding abstract], is advantageous for spruce, fir [*Abies*], and pine wood.

Larson (H. R.), Matthews (R. E. F.), & Walker (J. C.). **Relationships between certain viruses affecting the genus Brassica.**—*Phytopathology*, 40, 10, pp. 955–962, 3 figs., 1950.

In the present joint investigation of the Division of Fruit and Vegetable Crops and Diseases, U.S. Department of Agriculture, and the University of Wisconsin, confirmation of previous work [*R.A.M.*, 24, p. 438] on the relationships of virus strains included in the turnip virus 1 group [turnip mosaic virus] and in the cauliflower virus 1 group [cauliflower mosaic virus: ibid., 29, p. 449] was sought by means of precipitin tests and electron microscopy.

Serological tests demonstrated the relationship between Tompkins's cabbage black ring virus [loc. cit.], cabbage virus A [ibid., 27, p. 269], Smith's cabbage black ring spot virus [ibid., 14, p. 669], and horse-radish mosaic virus [ibid., 28, p. 43], all of which, therefore, are strains of turnip mosaic virus. The virus-antiserum precipitates of this group were of the rapidly forming, open, flocculent 'H' type, indicating that the virus particles were rod-shaped, as was subsequently shown by examination under the electron microscope. A correlation was observed between the presence of rods in and the infectivity of centrifuged sap from plants infected by the turnip mosaic virus group. This association of rod-shaped particles with both infectivity and antigenicity suggest that strains of this group have long, flexuous rods [cf. ibid., 30, p. 208 and below, p. 305].

No positive reactions with any antisera were obtained with the viruses of the cauliflower mosaic group, namely, this virus itself (from C. M. Tompkins) [ibid., 17, p. 6], cabbage virus B [ibid., 25, p. 245], and Chinese cabbage mosaic virus [ibid., 17, p. 574; 29, pp. 402, 494].

Buhl (C.). **Die sogenannte 'Umfallerkrankheit' der Kohlsamenträger (Brassica oleracea L.). (Vorläufige Mitteilung.)** [The so-called 'collapsing disease' of Cabbage seed stalks (*Brassica oleracea* L.). (Preliminary note.)]—*NachrBl. dtsch. PflSchDienst* (*Braunschw.*), **2**, 1, pp. 3–5, 3 figs., 1950.

Since 1940 a cabbage disease in the Dithmarsch market-gardening area near Kiel [Schleswig-Holstein] has become progressively more severe and gravely threatens seed production. It is known as 'collapsing disease' from the most conspicuous symptom. The peduncles begin to wilt at flowering time or later, as the siliquae are developing; occasionally they may even wither at the large-bud stage. According to the time of infection the plants produce either low-grade seed or none. Immediately above soil-level the medulla is decomposed and filled with a malodorous pulpy mass, which dries up more or less in correspondence with the prevailing weather conditions. The stalk becomes hollow and rotten and easily snaps. In time even supported plants break off just above soil-level.

All the locally cultivated varieties of white, Savoy, and red cabbage suffer from the 'collapsing disease', but to a varying extent. In 1949, when the trouble was prevalent, the average reduction in the white and Savoy crops was 30 to 40 (maximum 80) per cent., compared with only 6 per cent. for red cabbage. However, in the previous year, losses of up to 70 per cent. were reported for the last-named also. Evidently, therefore, the disease is of paramount economic importance as a factor in the lowering of local seed production.

Isolates from the rotted stalks of collapsed plants yielded predominantly (84 per cent.) bacteria, the few fungi encountered being mainly saprophytes. Typical symptoms of the disease were induced in wounded plants by inoculation with crude cultures of the bacteria, studies on the identity of which are in progress. From the results of laboratory and outdoor experiments the pathogenicity of the bacteria appears to be confined to plants injured by insect feeding or mechanical operations. Under laboratory conditions the average incubation period of the disease was 15 days, with a maximum of 21, so that infection occurs presumably during the growing period in the second year of cultivation. Besides temperature and humidity relations, overwintering conditions are of critical importance in determining predisposition to the disease. Plants should be stored in a dry, uniformly cool atmosphere such as a barn or cold greenhouse. Another decisive factor is the first season's manuring. Experience indicates that the superluxuriant stands mostly resulting from unduly lavish nitrogenous soil amendments produce stalks inferior to those more sparingly treated. Second-year plants should be set as nearly as possible at the same level as in the previous autumn, and in any case not too deep.

Disinfection experiments with white cabbage by the late Dr. W. Noll were carried out in November, 1945, and February, 1946, and involved 15 minutes' total immersion of the plants, in fungicides. The stronger concentrations proved injurious to the heads, and accordingly in February the stalks only were brushed with the solutions. Of 37 plants treated with 0·1 per cent. germisan, 86 per cent. were healthy on 31st May, the corresponding figures for 0·5 per cent. ceresan (17 plants) and 0·1 per cent. ceresan (37) being 94 and 100 per cent., respectively; for 0·5 per cent. (18 plants) and 0·1 per cent. abavit (40) 100 and 95 per cent.; for 0·06 per cent. kortofin [ibid., 28, p. 554] (35 plants) 100 per cent.; and for 19 plants dipped in a mixture of 0·3 per cent. kortofin and 10 per cent. O. carbolineum 95 per cent. In three sets of 75, 86, and 54 untreated plants the percentages free from infection were 72, 53, and 41, respectively.

Control by the excision of incipient stalk rots is successful only if the operation is performed before the medulla is too deeply penetrated.

Reinking (O. A.) & Newhall (A. G.). **A soil fumigation test for Pea root rot control.**—*Phytopathology*, 40, 10, pp. 879–882, 1 fig., 1950.

On 10th May, 1949, at a soil temperature of 52° F. at 3-in. depth, four fumigants were applied to plots in a Dunkirk loam field at the New York (Geneva) Agricultural Experiment Station cropped with peas since 1946 and heavily contaminated by the root rot organisms *Fusarium solani* var. *martii* f. 2 [*R.A.M.*, 27, p. 169] and *Aphanomyces euteiches* [ibid., 27, p. 509]. The treatments consisted of chloropicrin [ibid., 27, p. 155] at 1,460 lb. (104 gals.) per acre, dowfume N [ibid., 29, p. 269] (1,325 lb. or 135 gals.), 10 per cent. dowfume G [ibid., 28, p. 470] (3,000 lb. or 260 gals.), and Experimental No. 100. They were applied 6 in. deep on 8-in. centres with a Maclean 'Fumigun' or hand applicator. On the 24th, after a rainfall of 1·4 in. (mostly on the 22nd), spergon-treated Thomas Laxton pea seed was sown. On 28th June, after nearly five weeks without appreciable rain, 50 plants were removed from the centre of each plot and assessed in respect of severity of root rot symptoms.

Using a root rot index in which 100 represented severe rotting, 80 moderate, 40 mild, 20 very mild, and 0 healthy, chloropicrin was rated at 21, the other fumigants at 50 to 54, and the untreated at 55. In the chloropicrin test there was no severe infection, and only 12 per cent. moderate, while 36 per cent. of the plants were healthy. All the controls showed some infection, 18 per cent. severe and 50 per cent. moderate, and no substantial benefit was derived from any of the treatments except chloropicrin.

F. solani var. *martii* f. 2 was found to be the sole agent of the root rot, confirming previous observations as to the relative unimportance of *A. euteiches* in an extremely dry growing season even in infested soil [ibid., 22, p. 285]. Control of the former pathogen by means of soil fumigation does not appear from these results to be practicable at the moment.

Schrödter (H.) & Stoll (K.). **Untersuchungen über das Mikroklima in Ackerbohnenbeständen verschiedener Bestandsdichte und seinen Einfluß auf den Sporenaustritt von Ascochyta pinodella Jones.** [Investigations into the microclimate of field Bean plots having different plant densities and its influence on the spore discharge of *Aschochyta pinodella* Jones.]—*NachrBl. dtsch. PflSchDienst, Berl.*, N.F., 3, 5–6, pp. 88–96; 7–8, pp. 144–147, 9 graphs, 1949. [Received June, 1950.]

The results of studies carried out in June, 1948, at the Aschersleben branch of the Central Biological Institute, Germany, showed that temperature and humidity are the most important factors influencing the spore discharge of *Ascochyta pinodella* [*R.A.M.*, 30, p. 184] in broad bean stands, especially when they are densely planted. Medium, fairly constant temperatures and high humidity are favourable. Intense spore discharge can be expected only between 8° and 22° C., with humidity exceeding 90 per cent. for more than eight hours. High or greatly fluctuating temperatures require longer hours of high humidity. Such favourable conditions are found in maritime climates, where the fungus is most damaging, especially in the coastal districts of Schleswig-Holstein.

Schrödter (H.). **Über den Einfluss des Taus auf den Sporenaustritt von Ascochyta pinodella.** [On the influence of dew on spore discharge of *Ascochyta pinodella*.] —*NachrBl. dtsch. PflSchDienst, Berl.*, N.F., 3, 9–10, 5 graphs, 1949. [Received June, 1950.]

Further investigations in September, 1949, into the influence of microclimate on the spore discharge of *Ascochyta pinodella* [see preceding abstract] showed a close correlation between the length of time dew remained on the broad bean plants and the intensity of spore discharge.

Stahmann (M. A.), Hagedorn (D. J.), & Burger (W. C.). **The electron micrography of the Wisconsin Pea-streak virus.**—*Phytopathology*, 40, 11, pp. 999–1006, 3 figs., 1950.

The electron micrographs prepared at the University of Wisconsin from the pellets obtained from Perfected Wales pea plants inoculated with the Wisconsin pea streak virus [*R.A.M.*, 29, p. 241] showed thread-like, filamentous particles of different lengths (often several thousand m μ), and a width between 10 and 14 m μ. In extracts taken from naturally infected plants prior to symptom expression the particles appeared to be shorter than those from plants showing severe symptoms. The ends of the particles possess a chemical structure that has a high affinity or reactivity for combining with the ends or sides of other virus particles, thus causing random network to form. An extreme end-to-end aggregation also occurred when solutions of the purified virus in distilled water were stored at 4° C. The thread-like fibres were sometimes too long to be measured in the electron micrographs. Bundles containing several parallel strands of particles, which often coiled about each other, were also observed.

Infectivity tests demonstrated that most of the virus of the Wisconsin pea streak disease is associated with the insoluble tissue fragments. With suspensions of the insoluble tissue inoculated into healthy pea plants there was usually a high percentage of transmission, whereas little or none was obtained with clarified aqueous extracts.

Thomas (H. R.) & Zaumeyer (W. J.). **Inheritance of symptom expression of pod mottle virus.**—*Phytopathology*, 40, 11, pp. 1007–1010, 1 fig., 1950.

Greenhouse experiments at the Plant Industry Station, Beltsville, Maryland, were used to study the inheritance of local lesion and systemic responses of bean (*Phaseolus vulgaris*) hybrids inoculated with the bean pod mottle virus [*R.A.M.*, 28, p. 1]. Of the selfed parents used in the various crosses, Great Northern U.I. No. 1, Pinto No. 14, Rival, U.S. No. 5 Refugee, and Pinto (Colorado strain) developed local lesions, and Full Measure, Red Kidney, Tendergreen [loc. cit.], and No. 1197 were homozygous for systemic mottle. All the F_1 plants from crosses between local lesion and systemic type parents developed local lesions. This type of symptom expression proved to be dominant and governed by a single allelomorphic gene pair. No variety was immune. The 41 varieties carrying the dominant local lesion character may be regarded as commercially resistant since there is little or no damage to the plant. Most of those resistant to common bean mosaic virus are of this type.

Quantz (L.). **Beobachtungen zur Samenübertragbarkeit eines Mosaikvirus der Ackerbohne (Vicia faba L.).** [Observations on the seed transmissibility of a mosaic virus of the field Bean (*Vicia faba* L.).]—*NachrBl. dtsch. PflSchDienst* (*Braunschw.*), 2, 11, pp. 172–173, 1 fig., 1950.

A test was made at the Institute for Virus Research, Celle [Hanover], to determine whether the prevalent mosaic of field bean (*Vicia faba* var. *major*) [pea mosaic virus: *R.A.M.*, 7, p. 134; 9, p. 120] is seed-transmissible. Of 45 seedlings from a heavily infected 1949 crop sown in an insect-proof greenhouse in February, 1950, three were obviously infected and 16 doubtful. Two out of 15 inoculations on peas with sap from some of the doubtful and apparently healthy plants resulted in the development of mosaic symptoms. Thus, at least five of 45 seedlings (11 per cent.) were infected at the time of emergence. Field observations early in May confirmed these results, the leaves of two isolated plants in a plot of 75, for instance, being swollen, rolled, and faintly mottled.

The virus is also transmitted through the seed of *V. faba* var. *minor* [ibid., 26, p. 372], of which at least two out of 40 seedlings, progeny of a single diseased plant,

were infected. The virus isolated from this material proved to be identical with that occurring in var. *major*.

RØED (H.). **Botrytis gray mould on Allium cepa and Allium ascalonicum in Norway.**—*Acta agric. scand.*, 1, 1, pp. 20–39, 5 figs., 1950.

Grey mould caused by *Botrytis* sp., one of the most common diseases of onions and shallots in Norway and possibly the one causing the most damage, is particularly severe on stored onions and has at times threatened the continued growth of this crop. Twenty-one Norwegian isolates from onion and shallot and cultures of *B. allii* [*R.A.M.*, 30, p. 211], *B. byssoidea* [loc. cit.], and *B. squamosa* [C.M.I. map No. 164] from Denmark and Holland were compared. From the disease symptoms and the properties and morphology of the fungi in pure culture the isolates fell into three groups. The largest group consisted of *B. allii* and included isolates from both onion and shallot. There were three isolates only in the second, all from shallot. Macroscopically these did not differ from *B. allii* in pure culture but the growth rate was lower and the conidiophores (250 to 500 by 8 to 10 μ) and conidia (ranging on an average from 6·58 to 6·98 by 4·06 to 4·27 μ) smaller than is usual for this species. The author considers the fungus from shallot to be a small-spored variety of *B. allii*. The symptoms, morphology and properties in pure culture on different media are described. The third group consisted of one isolate only (from onion), which is tentatively designated *B.* cf. *byssoidea*.

The results of these investigations and of examinations of samples of infected bulbs indicated that *B. allii* is the primary cause of grey rot in Norway. It occurs throughout the country, being particularly prevalent on the coast and in the north. The danger of infection is reduced by growing conditions which permit the bulbs to mature early and suffer the least possible injury during harvesting, and by the removal of dead leaves and roots. Heavy damage may be prevented by artificial drying of the bulbs [*R.A.M.*, 6, p. 267] combined with storage at 0 to 2° C. and adequate ventilation to reduce humidity.

MUKULA (J.). **Säilytysaineiden käytöstä Porkkanan varastoimisessa.** [On the chemical prevention of storage rot in Carrots.]—*Maataloust. Aikakausk.*, 22, pp. 86–92, 2 figs., 1950. [English summary.]

During 1948 to 1950 at the Agricultural Research Institute, Tikkurila, Finland, the efficacy of fusarex dust [*R.A.M.*, 29, p. 328] at ½ kg. per 100 kg. was tested against carrot storage rots; belvitan K dust, a Bayer product of unknown composition (at 0·2 kg. per 100 kg.), was given preliminary tests. The relative air humidity in the sheds varied from 70 to 95 per cent., at temperatures from 2° to 6° C. The carrots, dusted uniformly with the materials, were stored for about 6 months in boxes with either almost closed sides or large slits.

The decay of fusarex-treated carrots in closed boxes after three months was 6 to 15 per cent., while the untreated had 25 to 71 per cent. Similar results were obtained with belvitan K. In slit boxes fusarex was effective on undamaged carrots at the beginning of the storage period, but towards the end it was ineffective in all groups. The rotting was mainly caused by *Botrytis* sp., *Sclerotinia sclerotiorum*, *Fusarium avenaceum*, and *Stemphylium radicinum* [ibid., 28, pp. 440, 510, *et passim*]. Fusarex and belvitan K inhibited the first two fungi if treatment was given before rotting began. However, fusarex did not seem to control *F. avenaceum*. In one test the effect of fusarex was of short duration on healthy and broken carrots in open boxes, and no control was obtained on roots damaged by maggots (*Psila rosae*), possibly due to the fungi involved (*F. avenaceum* being the most common) or the volatilization of the effective ingredients [ibid., 28, p. 641].

Used commercially in Helsinki, fusarex allowed only 0 to 5 per cent. losses of

healthy carrots, even after three to five months' storage. Neither fungicide impaired the taste of carrots.

GROGAN (R. G.) & BARDIN (R.). **Some aspects concerning seed transmission of Lettuce mosaic virus.**—Abs. in *Phytopathology*, 40, 10, p. 965, 1950.

Lettuce mosaic virus [*R.A.M.*, 27, p. 214; 30, p. 20], a source of considerable damage in the commercial crop of the central coastal area of California, was seed-borne in all the lots tested, while a high percentage of the plants in every field so far examined was affected by the disease. In different varieties incidence of seed-borne mosaic ranged from 1 to 8 per cent. [ibid., 29, p. 247], some consistently carrying higher percentages than others. Accurate readings of seed-borne mosaic can be secured only by providing the seedlings with plenty of room, otherwise low readings will result from the elimination of weak plants or failure of symptom expression. Attempts to free lettuce seed of the mosaic virus were unsuccessful owing to the heavy decline in germination before any apparent inactivation of the virus was effected. The percentage of infection was neither increased nor decreased by separation of the seed into light and heavy fractions.

PARRIS (G. K.). **Recent advances in Watermelon disease control.**—*Proc. Fla hort. Soc.*, 62, pp. 146–148, 1949.

In this paper, most of which has already been noticed from another source [*R.A.M.*, 29, p. 74], it is stated that gummy stem blight (*Mycosphaerella melonis*) [ibid., 29, p. 137] and anthracnose (*Colletotrichum lagenarium*) [ibid., 29, pp. 88, 341] of watermelons in Florida are best controlled by spraying with dithane Z-78. Tribasic copper sulphate gave the best control of downy mildew (*Peronoplasmopara* [*Pseudoperonospora*] *cubensis* [ibid., 29, p. 454]), closely followed by zerlate.

A mimeographed note added after printing states that in spray and dust tests carried out in 1950, parzate proved equal to dithane in the control of mildew, and probably they would act similarly in the control of anthracnose.

ELLIS (D. E.). **Ascochyta blight of Okra in western North Carolina.**—*Phytopathology*, 40, 11, pp. 1056–1058, 1 fig., 1950.

Severe epiphytotics of *Ascochyta* blight of *Hibiscus esculentus* caused by *A. abelmoschi* [*R.A.M.*, 7, p. 297; 30, p. 55] occurred in 1948 and 1949 in the mountain area near Hendersonville, North Carolina, causing heavy commercial losses. The disease was first observed in July, but was most severe in September, when defoliation in both years ranged from 50 to 90 per cent., severe flower and pod infections destroying yields almost completely. Clemson Spineless, Louisiana Green Velvet, and Perkins' Spineless varieties were equally affected. It is the first record of the fungus in North Carolina; its development appears to be favoured by relatively cool weather.

In addition to pod and stem symptoms, lesions also developed on leaves and flowers. Typical spots on the leaves and stems were irregular, with purple to black margins and grey centres which bore pycnidia. The necrotic centres frequently fell out. Inoculation of young plants resulted in similar leaf symptoms. Infection of unopened buds resulted in flower destruction, and the fungus frequently spread to adjoining stems.

In a preliminary test in 1949 with various fungicides on Louisiana Green Velvet all the sprayed plots gave higher yields of marketable green pods than unsprayed plants. High yields were correlated with low defoliation ratings. The best results were obtained with 2–100 fermate, but even this material did not control the disease satisfactorily.

Wood (F. C.). **Bacterial rot and weeping disease of the cultivated Mushroom.**—*Mushroom News* (W. Darlington & Sons, Ltd., Worthing, Sussex), 3, 2, pp. 23–27, 2 figs., 1950.

For many years commercial mushroom growers have been acquainted with a bacterial rot which attacks mushrooms when half grown so that they darken and become slimy on the outside, revealing a brown tissue discoloration when cut longitudinally. The 'weeping' phase of the disease, characterized by the exudation of drops of clear liquid from the pileus, occurs sporadically in patches of the beds. The liquid drips continuously until the casing soil and compost become saturated. This disease occurs in Great Britain mostly on mushrooms where the veil had not yet opened; it does not spread rapidly in the beds. The discharge of liquid was succeeded gradually by a progressive rot, the internal tissues becoming sodden and yellow.

Cultures from droplets and from the internal tissues of affected mushrooms showed the causal organism to be a bacterium of the *Bacterium carotovorum* [*Erwinia carotovora*] group. Young tomato plants inoculated with water suspensions of the organism developed a progressive soft rot of the leaves after ten days. Rot also developed within 48 hours on sterile cucumber slices and injured mushrooms after inoculations with turbid suspensions. A layer of brown stained material appeared in the stalks of young mushrooms which had stood with the cut end in a bacterial suspension for 48 hours. In all cases subsequent spraying with *Bacillus subtilis* or with any of the other saprophytic organisms isolated increased the rate of rotting and produced the odour characteristic of bacterial rot. In no case was the siphoning action reproduced in the laboratory.

So far control measures against 'weeping disease' have proved difficult, but in one nursery it was found that the best practice was to remove the affected mushrooms, leaving the hole with the compost exposed and dusting it with hydrated lime.

Orłoś (H.). **Grzyby jadalne i trujące.** [Edible and poisonous fungi.]—*Podręczn.* (Ser. D), *Inst. Bad. Leśn.* 3, 223 pp., 40 col. pl. 1949. [Abs. in *For. Abstr.*, 12, 2, p. 230, 1950.]

This is a practical textbook on the harvesting and processing of edible fungi.

Du Plessis (S. J.). **Noteworthy Vine diseases abroad.**—*Fmg S. Afr.*, 25, 295, pp. 322–328, 8 figs., 1950.

Notes are given on vine diseases studied by the author during a tour of North America and western and southern Europe in 1949. The assumption that Pierce's disease (lucerne dwarf virus) [*R.A.M.*, 29, pp. 75, 245, 401], is one of the most serious of vine diseases is fully justified. To some extent its periodicity constitutes its chief danger. The most characteristic symptoms, usually developing in the later part of the season, are the irregular, dried-up, marginal leaf areas and the sudden collapse of infected vines without shedding the semi-mature crop, but examples of die-back of bearers and interveinal leaf mottle were seen in May.

The names roncet, nettle leaf, urticado, or reisigkrankheit are preferable to court-noué [ibid., 29, p. 601; 30, p. 213] as so many diseases may cause short internodes, whereas in most cases of the former nettle-leaf patterns predominate, although they develop only in the advanced stages. Branas stated that vine crops near Montpellier declined by 30 per cent. from 1930 to 1939 as compared with the figures for 1920 to 1929, and ascribed most of this loss to the disease. The disease warrants serious consideration and immediate intensive study wherever it occurs.

In white mosaic or panachure [variegation: ibid., 16, p. 655; 17, p. 222; 25, p. 201; cf. 30, p. 137] the leaves gradually lose their green colour, at length completely, or show signs of a progressive albinosis along the veins extending in sharply

demarcated leaf areas from the original discolorations. Affected vines ultimately become completely infertile and die. The disease is present in two vineyards in California, in several in Portugal, and in many in Spain near Reus, Barcelona, and Villafranca del Panades; it is fairly generally distributed in southern and eastern France, occurs in a moderate form in Switzerland and Italy, and has been reported from Bulgaria and Czechoslovakia. The virus nature of the disease has been established.

One of the greatest difficulties with true mosaic (virus) [ibid., 28, pp. 2, 157; 29, p. 602] in France is that it often occurs together with court-noué on the same vine. The author's observations in France, Switzerland, and Sicily have convinced him that the two conditions are quite distinct though often associated. It appears to be most severe in southern France and Sicily.

The name 'witches' broom' is provisionally applied to a disease shown to the author by M. Staehelin in a Swiss vineyard in the Rhône valley above Lake Geneva. Affected vines are severely stunted. The shoots are tender, excessively branched, with short internodes or completely malformed, and bear pale, almost transparent leaves, most of which display severe marginal and interveinal burning and curling. The bunches are abnormal and unfertile. About 500 Sylvaner and Chasselas vines were affected. The disease was stated to have appeared about five years before and gradually spread. A similar condition was seen later near Wädenswil. The appearance and behaviour of this disease strongly suggest a virus origin. An almost identical disease in Spain has been ascribed to an insect.

Near Tenutella, Catania (Sicily), some shoots of *Vitis monticola* and *V. berlandieri* had exceptionally long internodes, while others were severely stunted. All the leaves on the affected vines were thickened, with strongly modified outlines and veinal arrangement, and usually distorted, curled, or irregularly puckered. The affected vines were unfertile and the growth habit totally disturbed. No similar condition is known to have been reported on vines anywhere. It is termed 'distortion disease'.

Of the diseases dealt with in this paper the only one found in South Africa [cf. ibid., 28, p. 49] is leaf roll [? vine mosaic virus: cf. ibid., 16, p. 587; 18, p. 810; 29, p. 137]. It is characterized by marginal, downward rolling and a tendency of the leaves to colour prematurely. A similar condition occurs in France, but is not considered to be serious or transmissible. Excellent examples were found at Geisenheim (Germany), but the workers there had obtained no convincing evidence of its transmissibility. In South Africa identical cases were observed in the Stellenbosch and Somerset West areas.

Evidence was obtained that vines are very sensitive to injury caused by hormone herbicides, such as 2,4-D [ibid., 29, p. 76] and weedone. Though hormones can cause widening of the petiolar sinus and a change of leaf pattern, these symptoms differ distinctly from those described above. Almost identical leaf symptoms also developed under natural conditions on untreated vines.

Du Plessis (S. J.). **Virus diseases and some symptomologically related abnormalities of the Vine.**—*Ann. Univ. Stellenbosch*, Sect. A., 26, 13, 33 pp., 8 pl., 1950. 5*s*.

The author summarizes and illustrates the virus diseases and related abnormalities of the vine. Most of the information presented has already been noticed from another source [see preceding abstract].

Nyland (G.) & Hewitt (W. B.). **Sooty blotch, a leaf spot of Vitis californica Benth.**—Abs. in *Phytopathology*, 40, 10, p. 969, 1950.

The conidial stage of an undetermined species of *Mycosphaerella* causing sooty blotch of *Vitis californica* in California [cf. *R.A.M.*, 21, p. 239] has been known as *Septosporium heterosporium*, but this is believed to be the first report of the

ascigerous stage. Spermogonia were observed in material collected in the latter part of the growing season, and perithecia were produced on the dead leaves during the winter, maturing early in the following spring. Inoculation experiments established the genetic relationship of the conidial and ascigerous stages. A comparison was made with herbarium specimens of sooty blotch on vine from India and South Africa, and it is considered likely that a species of *Mycosphaerella* is responsible in those countries as well as in the United States.

Hewitt (W. B.). **Fanleaf of Grapevines in California.**—Abs. in *Phytopathology*, 40, 10, p. 966, 1950.

Attention has already been drawn to the occurrence of vine fanleaf in California from another source [*R.A.M.*, 29, p. 601].

Milissavljević (D.). **Recherches sur la durée de la période d'incubation du Plasmopara viticola.** [Researches on the duration of the incubation period of *Plasmopara viticola*].—*Progr. agric. vitic.*, 134, 45–46, pp. 298–300, 1950.

This is the author's summary of work already noticed [*R.A.M.*, 30, p. 12].

Gordon (F. B.). **Genetics of viruses.**—*Ann. Rev. Microbiol.*, 4, pp. 151–168, 1950.

This review of the literature, mainly from 1939 to 1949 (118 titles), deals with the genetics of viruses (principally of animal origin).

Smith (K. M.). **Recent advances in the study of plant viruses. Second edition.**—viii+300 pp., 20 pl., 31 figs., 1 graph, 1 diag., London, J. & A. Churchill Ltd., 1951. 22*s.* 6*d.*

The text of this work [cf. *R.A.M.*, 12, p. 776] has been entirely re-written and a serious effort made to give a representative account of the present stage of knowledge of the subject. There are twelve chapters dealing, respectively, with introductory matters (theories on the nature of viruses and economic importance of plant viruses), symptomatology, physiology of virus-diseased plants, insects in relation to viruses, methods of transmission, methods of purification, the sizes of viruses and the methods employed to estimate them, electron microscopy, strains, mutations, and variation, serology, the control of plant virus diseases, and nomenclature. Each chapter has its own list of references.

Delap (Anne V.). **An interveinal injection needle.**—*Rep. E. Malling Res. Sta., 1949*, pp. 118–119, 6 figs., 1950.

An interveinal injection needle is described which slits the leaf and passes a filter paper wick through it [cf. *R.A.M.*, 18, p. 539] in one operation. The needle consists of two smooth strips of xylonite 0·4 mm. thick, the same width as the wick, and 1 in. and $1\frac{1}{4}$ in. long respectively. At one end the pieces are stuck together with a fragment of razor blade between. They are free at the unequal ends and the paper wick is slipped between them. The razor blade tip is pushed through the leaf and the needle drawn right through until the paper is in the slit. The method is suitable for apple and similar leaves, but not for thin, small leaves, such as potato.

Bawden (F. C.). **Plant pathology department.**—*Rep. Rothamst. exp. Sta., Harpenden, 1949*, pp. 59–64, 1950.

Further electromicrographs at Rothamsted [*R.A.M.*, 29, pp. 246, 474] showed that tobacco mosaic [cf. ibid., 29, p. 177], potato Y, potato paracrinkle [ibid., 29, p. 427], tobacco etch [ibid., 28, p. 438], henbane mosaic [cf. ibid., 24, p. 72; 29, p. 403], cucumber mosaic, and cabbage black ring [cf. ibid., 30, p. 297] viruses all have rod-shaped particles of constant widths, about 10 or 15 mμ, but of variable lengths.

Tomato bushy stunt [cf. ibid., 25, p. 437], tobacco ring spot [cf. ibid., 28, p. 492], a new virus from broad bean [cf. ibid., 29, p. 198], and the various tobacco necrosis viruses studied have spherical particles. Infective preparations of the Rothamsted culture of tobacco necrosis virus [ibid., 30, p. 126] have particles of two sizes, but only the smaller are found in crystalline, largely non-infective preparations. No specified particles were identified in the sap from plants infected with potato leaf roll, tomato spotted wilt, cauliflower mosaic [ibid., 30, p. 297], beet yellows, and beet mosaic viruses, or virus particles in the stomach contents of infective aphids.

Sap from broad beans affected by the new virus contains a specific antigen not present in healthy plants with a precipitin titre of about 1/500, which is approximately the same dilution end-point at which the sap ceases to cause infection when inoculated to healthy plants. The sap remains infective after ten minutes at 90° C. but not after a fortnight at room temperature. All plant viruses previously studied are precipitated by one-third saturated ammonium sulphate solution, but the bean virus requires three-quarters saturation.

A virus apparently related to tobacco ring spot, not previously recorded in the British Isles, was obtained from a mottled syringa (*Philadelphus* sp.) plant.

In further work on the yellowing of sugar beets of family 41 [ibid., 30, p. 91], seed from each of 20 single plants produced yellowed plants, but the time of appearance of the yellowing and its extent varied. Only three of 50 Kleinwanzleben E plants colonized with aphids [? *Myzus persicae*] from yellowed family 41 plants developed symptoms, suggesting a much lower rate of transmission than is usual with beet yellows virus.

Evidence was obtained that beet mosaic virus [ibid., 25, p. 532; 29, p. 240] occurs in strains of different virulence, one of which seems to cause a 'silver leaf' disease in red beet, though the same isolates of the virus may cause different symptoms in different varieties of red beet. Sap from beet leaves contains material which inhibits the infectivity of beet mosaic, tobacco mosaic, and other viruses. It is destroyed by heating to 80°, is non-dialysable, and is absorbed on to activated charcoal. It can be precipitated and concentrated by the treatments used to isolate a virus-inhibiting glycoprotein from *Phytolacca decandra* [cf. ibid., 27, p. 508; 30, p. 291].

Four lots of sugar beet stecklings from the north of Britain had under 1 per cent. yellows infection [ibid., 29, p. 598], four from Wales had 1, 1, 5, and 6 per cent., respectively, and one from Gloucestershire 6 per cent., though four lots from the eastern counties all developed over 85 per cent., together with much more mosaic and downy mildew [*Peronospora schachtii*: ibid., 25, p. 532]. Seed sown under barley in April produced stecklings with 11 per cent. yellows, as against 87 and 100 per cent., respectively, for July and September sowings without cover. Stecklings sprayed three times with insecticides E 605, pestox III, and HETP in the autumn of 1948, showed, in June, 1949, 10, 23, and 41 per cent. infection, as against 85 per cent. for the unsprayed. With all the insecticides used the first application was the least and the last the most beneficial.

When potato roots were inoculated with virus X the tubers set were often infected, though the virus seldom spread into the haulm and caused symptoms. Leaf roll [ibid., 30, p. 186] spread as readily to potatoes surrounded by sticky barriers, which prevented the passage of wingless aphids, as to those not so protected, suggesting that spread is largely due to winged forms. Virus Y infected nearly as many protected as unprotected plants.

The yield of wheat plants grown in pots outdoors with ammonium sulphate added, and under glass with nitrate, was reduced by 23 and 26 per cent., respectively, by *Cercosporella herpotrichoides* [ibid., 29, p. 247], and by 41 and 90 per cent. with no nitrogen added. Measurement of the depth of penetration by the fungus into the leaf sheath indicated that seven wheat varieties were the most susceptible to eyespot, oats next, and rye least. *Triticale* (wheat × rye) was intermediate between

the two parents. Infection caused an average loss of 50 per cent. of wheat grain yield, while rye and oats sustained no loss. A culture of *C. herpotrichoides* from oats in Bedfordshire was as pathogenic to wheat as cultures from wheat, but was more pathogenic to oats. *Lolium italicum*, *L. perenne*, and *Dactylis glomerata* were [experimentally] infected with *C. herpotrichoides* from wheat; the fungus was reisolated from each of the grasses and was still pathogenic to wheat.

Preliminary experiments on factors affecting rhizomorph production by *Armillaria mellea* [ibid., 29, p. 293] confirmed the part played by genetic factors, but indicated that the carbon-nitrogen ratio in the medium is important, a moderate carbohydrate supply and little nitrogen stimulating the most abundant formation.

Conners (I. L.) & Savile (D. B. O.). **Twenty-ninth Annual Report of the Canadian Plant Disease Survey, 1949.**—xxii+114 pp., 1 map, 1950. [Mimeographed.]

In the section of this report [cf. *R.A.M.*, 29, p. 80; 30, p. 17] dealing with new or noteworthy diseases (pp. ii–v) [given also in French] it is stated that wheat leaf [brown] rust (*Puccinia triticina*) [ibid., 29, pp. 142, 149, 291, 495] appeared early in Manitoba in 1949 and rapidly reached epidemic proportions throughout most of the Province and eastern Saskatchewan; infection was also heavy in parts of eastern Canada. Races capable of attacking Renown and Regent [ibid., 28, p. 623] are now present in the Prairie Provinces almost to the exclusion of others. While the new American variety Lee (Hope×Timstein) [ibid., 30, p. 221] has proved highly resistant in prairie trials, collections of the rust made in southern Alberta and south-eastern British Columbia attacked it more or less heavily. Eyespot (*Cercosporella herpotrichoides*) [C.M.I. map No. 74], not previously reported in Canada, was detected on winter wheat from Durham county, Ontario. Common root rot (*Helminthosporium sativum* and *Fusarium* spp.) [*R.A.M.*, 29, pp. 254, 291] was more prevalent on wheat in Saskatchewan than in any previous year for which data are available, and was more prevalent than usual in Alberta and Manitoba. Seed sterility due to *Podosporiella verticillata* [ibid., 4, p. 151], not previously recorded in Canada, was found in trace amounts in 11 samples of common and durum wheats in an area extending from Assiniboia, Saskatchewan, to Edmonton, Alberta. Bacterial stalk rot (*Erwinia dissolvens*) [ibid., 28, p. 513] killed 10 per cent. of the plants in one inbred maize planting in Essex county, Ontario.

Rust (*Melampsora lini*) [ibid., 29, p. 213] was present in scattered fields of Dakota flax [ibid., 28, p. 562] in Manitoba, though this variety was not affected in 1948. That flax-growing in Manitoba and Saskatchewan depends on using varieties resistant to wilt (*Fusarium oxysporum* f. *lini*) [*F. lini*: ibid., 29, p. 214] was demonstrated when 20 acres of Crown flax were sown to complete a field of Dakota; almost all the Crown plants were killed by wilt, though only traces developed in Dakota. Seedling blight (*Rhizoctonia* [*Corticium*] *solani*) is most severe after barley.

A new seedling blight of asparagus, caused by *F. oxysporum*, was described from the Niagara Peninsula, Ontario. Violet root rot (*Rhizoctonia crocorum*) [*Helicobasidium purpureum*: cf. ibid., 14, p. 730; 21, p. 65; 29, p. 330] was found for the first time in Ontario, being prevalent on carrots in one area in Lambton county. One of the most important seed-borne diseases of peas in Manitoba is *Pseudomonas pisi* [cf. ibid., 24, p. 151; 28, p. 557].

Fireblight (*Erwinia amylovora*) [ibid., 30, p. 15] was more serious than for many years on pear and apple trees in the Okanagan Valley and the Kootenays, British Columbia. Increase in perennial canker (*Neofabraea perennans*) [ibid., 23, p. 4] is ascribed to the use of new insecticides [cf. ibid., 29, p. 106] which kill the woolly aphis [*Aphelinus mali*] parasites. Strawberry red stele [red core] (*Phytophthora fragariae*) [ibid., 29, pp. 81, 458] was observed for the first time in New Brunswick. Strawberry yellows [yellow edge] virus [ibid., 16, p. 761] was severe and general in the Marshall variety [ibid., 28, p. 69] in coastal parts of British Columbia; leaf blight

(*Dendrophoma obscurans*) [ibid., 29, p. 81] was prevalent in Ontario late in the season. Downy mildew (*Peronospora ? antirrhini*) [C.M.I. map No. 222] found on *Antirrhinum* plants in Ontario is new to Canada.

Gnomonia fragariae var. *fructicola* and its pycnidial state *Zythia fragariae* [cf. *R.A.M.*, 28, p. 473] were isolated from strawberry leaf blotch at Ottawa; this is the first record of the fungus in Canada, though the disease was probably present before, but confused with others.

Cone rust (*Chrysomyxa pyrolae*) [ibid., 30, pp. 124, 202] was unusually heavy on *Picea engelmanni* and *P. glauca* var. *albertiana* in British Columbia.

J. F. Hockey, dealing with work on a summer survey in Newfoundland in 1949 (pp. xv–xx) states that potato wart (*Synchytrium endobioticum*) [ibid., 19, p. 688; 22, p. 10; 23, p. 3] was common in gardens and small plots in many localities of the Avalon Peninsula and along the east coast; it was not observed along the west coast. Plants of Arran Victory were 100 per cent. affected in one plot; adjacent Arran Pilot plants showed some infection, but Sebago was unaffected when inspected. Arran Banner, Great Scot, and Kerr's Pink were also susceptible. Mosaic [ibid., 25, p. 61; 26, p. 209] was much more frequent (but under 20 per cent.) than leaf roll (2 per cent.). Mild mosaic [? virus A] was found in a few fields, infection ranging from 30 to 90 per cent.

A report is given (pp. ix–xiii) on the effects of the 1949 weather conditions on plant diseases in different parts of Canada.

Nattrass (R. M.). **Annual Report of the Senior Plant Pathologist, 1948.**—*Rep. Dep. Agric. Kenya, 1948*, pp. 95–98, 1950.

Of the seven physiologic forms of wheat stem rust [*Puccinia graminis*] already known in Kenya, K. 1 and K. 4 were detected most frequently during the period under review [cf. *R.A.M.*, 28, p. 444]. H. C. Thorpe reports (p. 110) that a new wheat variety 261.S.10.C.2.D, which had proved resistant to the seven physiologic forms isolated in Kenya, was attacked by K 8 [ibid., 28, p. 517] in Tanganyika. This race attacks the varieties 112.A, Einkorn, and B. 256.G. It has not yet been found in the field in Kenya. The presence of a new form necessitates a re-examination of the breeding programme and the discarding of all crosses in which both parents show susceptibility. Of the established wheat varieties Kenya Governor, 291.J.1.I.1, 318.O.3.B.2, and 261.R.7.C.1.B. are resistant to race 8 [loc. cit.]; Equator, 117.A, and 294.M.7.C.6.A border on susceptibility, and Regent 975·6 is susceptible.

Eight more varieties of potatoes immune from blight (*Phytophthora infestans*) were received from Dr. Black [ibid., 30, p. 69]. Immune varieties already introduced are now in commercial production. Of those tested during the year the most promising appeared to be 914*a* (12) and 1427*a* (8). Blight [ibid., 29, p. 389] was again widespread on potato and tomato during the year, completely destroying the latter crop in many places. Two samples of potato bacterial wilt (*Xanthomonas solanacearum*) [ibid., 27, p. 353] were received, to which *Solanum nigrum* proved susceptible by inoculation.

The bud disease (*Ramularia bellunensis*) of pyrethrum [*Chrysanthemum cinerariifolium*: ibid., 30, p. 79] continued to be widespread, and root and crown disease associated with *Fusarium* spp. and *Sclerotinia minor* occurred sporadically.

Take-all of wheat (*Ophiobolus graminis*) [ibid., 22, p. 246] occurred occasionally on the Plateau. A maize disease, apparently of bacterial origin, which caused a soft, wet rot of the nodes and the base of the cobs, occurred in various localities west of the Rift Valley.

French beans [*Phaseolus vulgaris*] were attacked by *Colletotrichum lindemuthianum* [C.M.I. map No. 177] and halo blight (*Pseudomonas medicaginis* var. [f. sp.] *phaseolicola*) [ibid., No. 85]. The latter organism or a related species also

occurred on *Pueraria* sp. at Nairobi. A plot of cowpeas suffered a severe attack of *Septoria vignae* causing chocolate spot and defoliation. *Ascochyta phaseolorum* was also present on the same host. *S. lablabina* was recorded on *Dolichos lablab.* Lucerne was attacked by *Pseudopeziza medicaginis* [ibid., No. 129] and *Uromyces striatus* [*R.A.M.*, 21, p. 282] in several localities, and in the Nanyuki district was severely affected by *Helicobasidium purpureum.* Pasmo disease of flax (*Sphaerella linorum*) [ibid., 22, p. 358] was reported only once. Sunflowers grown as a commercial crop suffered severe attacks of rust (*Puccinia helianthi*) [C.M.I. map No. 195]. In one instance no distinct pustules were evident, the rust spreading in large patches over the leaves. Specimens severely attacked by *Cystopus tragopogonis* were received from many districts. A leaf spot caused by *Ascochyta* sp. (or possibly *Diplodina helianthi*), *Septoria helianthemi*, and *Alternaria zinniae* were also noted.

Armillaria mellea [*R.A.M.*, 30, p. 141] killed apple and plum trees in the Highlands and *Cupressus macrocarpa* and *Pinus insignis* in the Mau forest area. *Rosellinia necatrix* attacked apple and apricot trees and also strawberry plants, causing crown rot and death. 'Woodiness' [cucumber mosaic virus: ibid., 29, p. 604] was among the diseases attacking passion fruit (*Passiflora edulis*). Specimens were received of wild and cultivated *Rubus* spp. suffering from spur blight canker and die-back. All affected parts, particularly the fruits, bore profuse, pink spore masses of *Gloeosporium* sp. *G. fructigenum* [*Glomerella cingulata*: ibid., 28, p. 210] caused a rot of pears on the tree. *Uncinula necator* injured ripening grapes and *Oospora* sp. caused end rot of bananas at 7,000 ft. *Trichoderma lignorum* [*T. viride*] and *Phomopsis* sp. were isolated from strawberry plants showing progressive decline, and leaf spot caused by *Mycosphaerella fragariae* [C.M.I. map No. 110] was generally present.

Other diseases of vegetables included *Septoria lactucae* [*R.A.M.*, 27, p. 158] on lettuce, and severe attacks of *Puccinia asparagi* on asparagus [C.M.I. map No. 216].

Dahlias were generally severely attacked by *Entyloma dahliae* [ibid., No. 114]. Leaf spots of *Gerbera jamesonii* were caused by the commonly occurring *Septoria gerberae* and, to a lesser degree, by *Ascochyta gerberae* and *Cercospora* sp. *Cystopus cubicus* [*C. tragopogonis*] was of common occurrence on this host. The apices of safflower (*Carthamus tinctorius*) plants were killed by *Gloeosporium* sp.

Wattle (*Acacia mollissima*) west of the Rift Valley suffered from a progressive disease causing the death of young trees over a wide area. In the early stages it appeared to be a severe form of phloem necrosis, followed later by swelling and cracking of the bark and distortion of the stem near ground level. There appeared to be no correlation between disease incidence and different soil types, and no peripheral spread occurred. The disease may prove to be of virus origin.

Cupressus pyramidalis has been added to the list of species susceptible to *Monochaetia unicornis* [*R.A.M.*, 30, p. 141]. In addition to the highly virulent form of the disease present in the main forest areas, where young plantations are seriously affected, there appears to be a mild form in the drier lower areas causing swelling and resin flow on the branches of large trees.

Wright (J.). **Investigations 1948-1949.**—*Bull. Dep. Agric. Jamaica* (N.S.) 45, 110 pp., 1950.

In the plant pathology section of this report [cf. *R.A.M.*, 29, p. 459] the following are recorded for the first time on economic hosts in Jamaica: *Stachylidium theobromae* [C.M.I. map No. 146], associated with a fruit ripening rot of Gros Michel bananas, *Alternanthera* [*Alternaria*] *dianthicola* [*R.A.M.*, 25, p. 580] causing branch rot of carnations, *Angiopsora zeae* [ibid., 26, p. 197] and *Puccinia polysora* [ibid., 21, p. 73] on maize, *Cercospora arachidicola* [C.M.I. map No. 166] on groundnuts, and frenching of tobacco [*R.A.M.*, 29, p. 605].

Knot disease of limes (*Sphaeropsis tumefaciens*) was observed in Hanover and is therefore apparently endemic throughout the north coast. A few individual cases

of wilting were reported near Bogue, St. Ann, after the heavy May rains. Shedding of all leaves and death of the trees occurred within 10 to 14 days. These symptoms and die-back of limes observed elsewhere seem comparable with the lime diseases of unknown origin under investigation elsewhere in the British West Indies [ibid., 29, p. 291]. Thread blight (*Corticium koleroga*) [C.M.I. map No. 64] was reported near Bog Walk and Porus after the summer and autumn rains. Up to 61 per cent. of citrus samples were rejected for export owing to scab [*Elsinoe fawcetti*: ibid., No. 125] and melanose [*Diaporthe citri*: ibid., No. 126].

There was a serious outbreak of *Phytophthora infestans* [ibid., No. 109] on tomatoes in St. Elizabeth. A hitherto undescribed non-pathogenic blemish designated brown end caused an appreciable rejection of fruit. Green fruit when picked showed a few small, irregular, discoloured areas at the blossom end which darkened in colour and increased to form a superficial, angular brownish patch on the ripe fruit. It was noted from all the tomato-growing areas.

Black shank (*Phytophthora parasitica* var. *nicotianae*) [*R.A.M.*, 5, p. 655] was found near May Pen on a newly introduced tobacco variety. The Jamaica hybrids in the same area appeared to resist it.

Puccinia sorghi is common on maize but is generally confined to the summer crop.

In preparation for trials to compare yields of healthy sugar cane and of that attacked by mosaic [ibid., 28, p. 545; 29, p. 122], clean tops were raised in a carefully rogued nursery in St. Thomas. Weekly roguing counts showed approximately $2\frac{1}{2}$ to $3\frac{1}{2}$ per cent. total infection in the varieties B. 34104, B. 4098, and BH. 10/12 up to the time of cutting back in March, 1949. An increase in mosaic incidence was regularly observed after rains during winter and early spring.

Plant diseases.—*Agric. Gaz. N.S.W.*, 61, 10, pp. 517–521, 5 figs.; 11, pp. 587–590, 4 figs., 1950.

Tomato blight (*Phytophthora infestans*) [*R.A.M.*, 11, p. 753; 29, p. 62] occurs sporadically in New South Wales; in 1950 attacks were reported from early districts on the North Coast. To prevent anticipated spread to the Central and South Coasts protective sprays with 2–2–40 Bordeaux mixture at ten-day intervals were advised, increasing to double concentration when blight appeared.

Wood rot of fruit trees caused by *Polystictus versicolor* and other fungi [ibid., 24, p. 318] can be prevented by the removal of all affected limbs and diseased wood, coating wounds and cuts with bituminous paint, cleaning old cavities and filling with concrete, and application of fertilizers and green manure.

During warm humid weather cucurbits in New South Wales suffer considerable damage from powdery mildew (*Erysiphe cichoracearum*) [cf. ibid., 23, p. 161]. Watermelons and jam melons are less affected than the susceptible rockmelons, cucumbers, marrows, squashes, and pumpkins; the rockmelon variety No. 45 is resistant. Marrows, pumpkins, and squashes should be dusted with sulphur, preferably starting prior to the appearance of the disease, and rockmelons and cucumbers sprayed with 3–4–40 Bordeaux mixture, all at weekly intervals.

Dr. Lilian Fraser reports that the heavy rainfall and flooding during 1949 and 1950 resulted in severe infections of citrus with *Phytophthora citrophthora* [ibid., 28, p. 571] in the low-lying coastal districts of New South Wales. In the early autumn maturing fruits of Washington Navel orange, lemon, and Emperor mandarin suffered serious brown rot damage. Abundant fructifications of the fungus developed on the affected fruits and to a lesser degree on leaves, causing a rapid spread of the disease on individual trees. Good control was obtained with Bordeaux sprays when applied prior to the autumn rains. Collar rot has also been unusually prevalent during the autumn, winter, and spring. Surgical treatment and painting the exposed surface with Bordeaux paint will check the disease, and as an additional safeguard drenching of the butts with 1–1–10 Bordeaux plus $\frac{1}{2}$ per cent. white oil

is recommended. Root rot due to the fungus has been particularly prevalent in orchards on heavy river soil and in badly drained hill localities. Under such conditions trees on the immune [*Poncirus*] *trifoliata* stock [loc. cit.] should be planted.

Report on agricultural research for the year ending June 30th, 1949.—*Rep. Ia agric. Exp. Sta., 1948–49*, 336 pp., [? 1950].

In the botany and plant pathology section (pp. 162–192) of this report [cf. *R.A.M.*, 29, p. 81] C. S. Reddy states that there may be specialized strains of the watermelon wilt organism, *Fusarium* [*bulbigenum* var. *niveum*], a line of the new wilt-resistant Missouri Queen being completely susceptible in one trial in infested soil at Conesville. In tests with 36 varieties of cantaloupes none wilted in severely infested soil. One of the more promising wilt-resistant lines is from a cross between Wondermelon, Jugoslav ✕ 7, and Iowa Belle made in 1942. In descending order the following fungicides were effective on cantaloupes against *Macrosporium* leaf blight [*Alternaria cucumerina*: ibid., 29, p. 604] which defoliated the unsprayed plot: Bordeaux mixture 4–2–50, bioquin, alternate applications of zerlate and Bordeaux, Tennessee tribasic copper sulphate, zerlate and tribasic combinations, parzate, zerlate, copper zinc chromate 640, phygon, and crag 341–b.

H. C. Murphy reports that oat diseases caused yield reductions of 13 per cent. in 1948, *Helminthosporium victoriae* being responsible for only 1 per cent. Races 45 and 57 of crown rust [*Puccinia coronata*: ibid., 30, pp. 32, 225] were the most widespread races in 1948 and caused much damage to susceptible varieties in south eastern states. Bond derivatives [loc. cit. and ibid., 29, p. 151] in 17 uniform rust nurseries where crown rust infection was recorded had an infection coefficient of 19 per cent. compared with 6 per cent. for Victoria derivatives. Markton, Bond, and Victoria had readings of 42, 22, and 3, respectively. *Leptosphaeria avenaria* [ibid., 28, p. 520] causing a leaf spot and culm infection of oats was first observed in April, 1948, on Clinton and most other varieties. Perithecia were present occasionally in older lesions. The variety Andrew appeared more susceptible than Clinton although all commercial named varieties were about equally susceptible to leaf infection at earlier stages of growth.

W. F. Buchholtz states that in a sugar beet plot at Kanawha infested with *Aphanomyces cochlioides* [ibid., 29, p. 81] seedling disease of 19 selected sugar beet lines and one variety was severe. Some lines recovered better than others. There was only a nominal amount of root rot later in the season.

In a section on plant disease survey of Iowa by W. F. Buchholtz, G. L. McNew, C. S. Reddy, G. Semeniuk, and W. J. Hooker it is stated that an epiphytotic of potato blight (*Phytophthora infestans*) was induced on a peat plot at Crystal Lake but not on a mineral soil plot. The factors contributing to the epiphytotic were rainfall frequency [ibid., 28, p. 540], the numerous successive nights of dew deposition, and the successive hours of low temperatures at night. The temperatures at ½, 15, and 60 in. above the soil surface did not differ significantly but humidity was greater at ½ and 15 in.

Resistance to [unspecified] root rot in maize was estimated by G. Semeniuk, C. S. Reddy, W. E. Loomis, E. W. Lindstrom, and G. F. Sprague by rating the root systems of 1 ft. depth in 25 open-pollinated Guatemalan varieties, 20 United States single crosses, and 19 United States inbred lines after three months' growth in the field. Root rot severity for the entire plot averaged 85 per cent. necrotic with 77, 87, and 90 per cent., respectively, for the three groups.

W. J. Hooker reports significant increases in yield of Cobbler potatoes (328 to 429 bush. per acre) grown on peat at Crystal Lake, due primarily to fungicidal control of early blight (*Alternaria solani*) [ibid., 29, p. 638], compared with 313 bush. when unprotected.

C. S. Reddy reports that spergon, phygon, and ceresan are recommended in Iowa

as maize seed treatments. Arasan SF should not be used at dosages of less than $\frac{2}{3}$ oz. per bush. Flax seed treatment with new improved ceresan [ibid., 29, p. 82] resulted in increases of 2·18 bush. per acre. The gain was more than 300 times the cost of the treatment material. Dehulled Clinton oats are easily injured by seed treatment if stored for several months before sowing. *Pythium* sp. was isolated consistently from non-germinating soy-bean seed in soil. The average percentage germination increases of 8 lots of Earliana and 6 lots of Lincoln soy-beans treated with arasan SF, spergon, panogen, and bioquin I and field grown were 19, 17, 15, and 14, respectively [cf. ibid., 29, p. 549].

J. M. Crall, J. C. Gilman, and G. L. McNew state that the most prevalent and serious disease of soy-beans during the period 22nd September to 2nd October, 1948, was brown stem (*Cephalosporium gregatum*) [ibid., 28, p. 204]. Some fields in the southern and eastern sections of the State had 50 per cent. of the plants affected. Stem canker (*Diaporthe phaseolorum* var. *batatatis*) [ibid., 30, p. 10] occurred in spots in seed-increase fields on the variety Adams at Ames and on scattered plants throughout the State. *Phyllosticta glycineum* [ibid., 27, p. 459] caused premature defoliation and was observed throughout. Although not generally destructive it is potentially dangerous.

G. L. McNew states that there was no further spread of *Chalara quercina* [ibid., 30, p. 142] in plots in Dolliver State Park from which all dead, dying, and a zone of living oaks were removed.

H. C. Murphy, C. S. Reddy, and R. Atkins report that despite an average barley yield of 32 bush. per acre in 1948, [unspecified] diseases [ibid., 29, p. 82] caused an estimated reduction of 21 per cent. The varieties most resistant to isolate P–76 of *Pythium graminicola*, as determined by the average root length and weight, were Montcalm, Trebi, Kindred, Pillsbury, and Mars, and also Clinton oats.

W. J. Hooker, C. S. Reddy, and L. Peterson state that the sulphur treatment against *Streptomyces ipomoea* [ibid., 29, p. 81] attacking sweet potatoes will give control for two years, but applications should not be too heavy so that yields will not be reduced. Dipping fleshy roots in spergon (2 oz. per gal.) increased slip yields. Stem rot (*Fusarium oxysporum* f. *batatas*) [*F. bulbigenum* var. *batatas*: loc. cit.; ibid., 29, p. 285] was reduced when slips were dipped before planting in spergon, arasan, or semesan bel.

Because of the increasing severity of onion smut [*Urocystis cepulae*: ibid., 29, p. 500] W. J. Hooker and G. Semeniuk tested a number of fungicides, amongst which arasan was effective in improving emergence, preventing smut, and increasing yield in 10 varieties and hybrids tested in the greenhouse. Beltsville Bunching exhibited resistance in field trials.

W. F. Buchholtz and G. L. McNew report that sour cherry budwood free of necrotic ring spot virus and yellows [virus: see below, p. 329] has been established for four strains of Montmorency and a strain of Early Richmond. In indexing a block of 101 Gilbert Montmorency scion trees five were detected as infected with necrotic ring spot virus and rogued.

G. L. McNew, C. H. Richardson, and H. L. Lantz report that cherry leaf infection by *Coccomyces hiemalis* [ibid., 28, p. 220] arising from one-year-old buds at Shenandoah was 40 to 70 per cent. on untreated trees and was reduced to 2 to 10 per cent. in trials with phygon XL, bioquin, Bordeaux mixture 4–2–50, fermate, crag 341-b, puratized agricultural spray, and Tennessee tribasic. Phygon, bioquin, Tennessee tribasic, and Bordeaux provided excellent protection against *Podosphaera oxyacanthae* [ibid., 26, p. 550], which appeared in severe form on younger leaves late in the season. Foliage infection by *Venturia inaequalis* [ibid., 29, p. 498, and below, p. 326] on young Jonathan and Starking apple trees was reduced from 26·2 per cent. to 1·5 by seven applications of fungicides, the most effective being phygon AL (6 oz. per 100 gals.), puratized (1 pt.), phygon XL ($\frac{3}{4}$ lb.), and dry lime sulphur (4 lb.).

Kelman (A.) & Jensen (J. H.). **Storage of isolates of Pseudomonas solanacearum under mineral oil in relation to virulence.**—*J. Elisha Mitchell sci. Soc.*, 66, 2, pp. 115–116, 1950.

Cultures of virulent isolates of *Pseudomonas* [*Xanthomonas*] *solanacearum* from potato, tobacco, and groundnut on potato dextrose agar slants were stored for four years under sterile mineral oil [cf. *R.A M.*, 29, p. 320]. Pathogenicity tests were made on tomato plants at least once a year, using sub-cultures of the original slants. In most instances the virulence of the inoculum from these isolates was comparable to that of new isolates. In 1949 several cultures stored under oil for four years were only slightly less pathogenic than a fresh, highly virulent isolate from a tobacco plant.

Eisenstark (A.) & Thornberry (H. H.). **Plaque formation by Xanthomonas pruni bacteriophage.**—*Phytopathology*, 40, 9, pp. 876–877, 1 fig., 1950.

The studies herein described were undertaken to find a method favouring plaque formation by the *Xanthomonas pruni* bacteriophage [*R.A.M.*, 30, p. 218] similar to that obtained with most bacteriophages. The usual semi-solid agar layering method generally suitable for plaque production was modified slightly in this instance. Clearly discernible and well distributed but non-uniform plaques were formed in the bacterial growth over the surface of the nutrient agar. Three distinct types of plaque predominated.

Zogg (H.). **Untersuchungen über Fusskrankheiten des Getreides.** [Studies on cereal foot rots.]—*Schweiz. landw. Mh.*, 28, 7, pp. 250–252, 2 figs., 1950.

With a view to the investigation [at the Zürich-Oerlikon Agricultural Experiment Station] of some aspects of the complex problem of cereal foot rots [*R.A.M.*, 29, p. 200], plots on a freshly ploughed strip of ground, 120 by 6 m., on which potatoes were grown in 1941, winter wheat in 1942, and summer wheat in 1943, the last-named severely parasitized by foot-rotting fungi, were sown from time to time with summer and winter wheat, summer and winter barley, summer and winter rye, and oats. So far the following organisms have been isolated: *Ophiobolus graminis* from all the cereals; *O. herpotrichus* from oats [ibid., 23, p. 282]; *Leptosphaeria herpotrichoides* from rye [ibid., 26, p. 439]; *L. eustomoides* from wheat; *L. clavata* from wheat, rye, and oats; *Lophodermium tritici* from rye; *Pleospora infectoria* from wheat, winter and summer barley, rye, and oats; *P. scrophulariae* from wheat; *Pyrenophora trichostoma* from all crops; *Acrospermum compressum* var. *graminum* [*A. graminum*] from wheat and rye; *Cercosporella herpotrichoides* from wheat [ibid., 29, p. 200]; *Fusarium nivale* [*Calonectria nivalis*] from rye; *F. culmorum* and *F. oxysporum* var. *aurantiacum* [cf. ibid., 24, p. 483] from wheat; *Wojnowicia graminis* from wheat and rye [ibid., 29, p. 423]; *Hendersonia aberrans* from wheat and oats; *H. mollis* from rye; *H. culmifraga* from oats; *Ascochyta graminicola* [ibid., 24, pp. 308, 387] from wheat; *Torula graminis* from wheat, barley, and rye; and *Rhabdospora* spp. from wheat and oats. The genera *Coniothyrium*, *Phoma*, *Diplodina*, *Leptodothiorella*, and *Heterosporium* were also represented by some new species.

These isolates and others, mostly from cereals in mountainous regions, served in the first place for studies on mixed infections, the results of which are to be published elsewhere *in extenso*. They showed that infection by two or more fungi may produce quite different effects from those caused by either alone. For instance, the action of *O. graminis* on wheat may be considerably enhanced by association with *A. graminicola*, while the mixture of the two individually weak pathogens, *F. oxysporum* var. *aurantiacum* and *F. orthoceras* var. *longius* [ibid.. 23, p. 473; 27, p. 204], may induce heavy infection of wheat.

Stakman (E. C.) & Loegering (W. Q.). **Physiologic races of Puccinia graminis in the United States in 1944.**—*Pap. sci. J. Ser., Minn. agric. Exp. Sta.* 2419, 8 pp., 1948. [Mimeographed. Received December, 1950.]

Data on the prevalence and distribution of physiologic races of *Puccinia graminis tritici* [see next abstract] and *P.g. avenae* in the United States during 1944 are presented in tabular form [cf. *R.A.M.*, 25, p. 62; 30, pp. 142, 150]. Races 56 [loc. cit.], 38, 17, and 19 (in descending order of prevalence) constituted 96·6 per cent. of the isolates from wheat, this being the seventh consecutive year in which these races have comprised 90 per cent. or more of all the isolates. Race 56, constituting 43·1 per cent. of the isolates in 1944 from 74 per cent. of all collections, has ranked first in prevalence in 10 out of 11 consecutive years. In the State of Washington, where all the inoculum came originally from barberries, 12 races were isolated and six of them were not found elsewhere in the United States. Races 56, 17, and 38 were not isolated at all in Washington.

The geographical range of race 38 was much wider than in 1943, when it predominated in the epidemic that spread from native barberries in the Virginias into Kentucky, Ohio, and Michigan but was rarely found in the Mississippi Valley. In the spring of 1944, however, it was relatively abundant in Texas [ibid., 30, p. 221] where it was later prevalent to the north. It seems likely that inoculum was blown into Texas from the north-east in the autumn of 1943, followed by spread northwards in the next spring; the race seems to have become independent of barberries for its persistence.

In the survey of *P.g. avenae*, race 2 constituted 66·7 per cent. of all isolates, race 8 combined with race 10 [ibid., 23, p. 433] constituted 32·8 per cent., and race 7 0·5 per cent. Race 8 had increased from 0·4 and 20·2 per cent. in 1942 and 1943, respectively. It was confined to Texas, the Mississippi Valley, Michigan, and Pennsylvania. Race 7 was found only in barberry areas in New York and Pennsylvania.

Loegering (W. Q.). **Survival of races of Wheat stem rust in mixtures.**—*Phytopathology*, 41, 1, pp. 56–65, 1 diag., 3 graphs, 1951.

Annual surveys of the races of wheat stem rust (*Puccinia graminis tritici*) in North Dakota [see preceding abstract] from 1938 to 1943, inclusive, showed that the ratio of isolates of race 56 to those of race 17 on Ceres was higher than on all grain throughout the United States, while on durum (mostly Mindum), the ratio of race 19 to race 17 was much higher than on all wheat in the country.

In the greenhouse experiments, using the method of Stakman *et al.* [*R.A.M.*, 19, p. 463], with certain modifications, for determining the capacity of stem rust to survive through several generations of the wheat plant, mixtures of two known races on susceptible seedlings of a certain variety were transferred to the same variety for several successive generations, in each of which the racial components in the population were analysed [cf. ibid., 24, p. 272]. Thus, a mixture of races 17 and 56 was grown for seven consecutive uredial generations on Ceres, Fulcaster, and Little Club, all apparently uniformly susceptible to both races. On Fulcaster and Little Club race 17 became predominant by a wide margin, while on Ceres it was only slightly preponderant. Similarly a mixture of races 17 and 19 was grown for six successive uredial generations on the equally susceptible Mindum, Fulcaster, and Little Club. Race 17 soon gained the upper hand on Fulcaster and Little Club, while on Mindum it was only slightly more prevalent than 19 at the end of the test.

Evidently the relative ability of races of wheat stem rust to multiply in mixtures is not due solely to differences in virulence, but depends also on the combined operation of subsidiary ecological factors.

Ciferri (R.) & Bertossi (Felice). **Efficacia anticarie dei trattamenti con dibromoetano alle cariossidi di Frumento.** [Anti-bunt efficacy of dibromoethane treatments as a bunticide for wheat.]—*Notiz. Malatt. Piante, 1950*, 12, pp. 65–67, 1950. [English summary. Mimeographed.]

Wheat grain artificially infected with bunt (*Tilletia* spp.) [see next abstract] was exposed in glass containers to the vapour from 1 per cent. ethylene dibromide in acetone [*R.A.M.*, 29, p. 269] at a rate of 60 gm. per cu.m. for about 24 hours at 19° to 22° C. It was then exposed to the air in the laboratory for two days and sown 12 days later. The results showed that 31·3 per cent. bunt resulted, as compared with 83·7 per cent. for the untreated. Treatment, however, reduced germination by about one-fifth [cf. ibid., 30, p. 263].

Grasso (V.). **La resistenza dei Grani duri alle carie (Tilletia spp.).** [The resistance of durum Wheats to bunt (*Tilletia* spp.).]—*Ann. Sper. agr.*, N.S., 5, pp. 411–418, 1951. [English summary.]

In a study of the resistance of durum wheat varieties to bunt (*Tilletia* spp.) in different localities in Italy [*R.A.M.*, 8, pp. 94, 228; 29, pp. 17, 91] during 1949–50, seed of the varieties Sen. Cappelli, Russello S.G. 7, Timilia, Saragolla, Azizia, Dauno, and Garigliano, and of the soft wheats Mentana, Solina, Avanzi 8, and Trento was inoculated with 1 per cent. by weight of chlamydospores from bunted wheat grown at Florence. This inoculum consisted of 91·3 per cent. *T. levis* [*T. foetida*], 5·7 per cent. *T. triticoides*, 1·5 per cent. *T. tritici* [*T. caries*], and 1·5 per cent. *T. intermedia*. All the varieties tested were susceptible, differences in the degree of infection shown by any one variety in different localities being due solely to environmental conditions. Spore counts from ears in all localities showed about the same proportions of the different species of *Tilletia* present as in the original inoculum.

Solina, with only 7·5 per cent. bunted ears, was the most resistant of the soft wheats, which were much more susceptible than the durum varieties [cf. ibid., 9, pp. 368, 636; 12, p. 559; 21, p. 190]. The most resistant durum was Russello S.G. 7, with 0 to 10·2 per cent. infected ears; its apparent immunity in certain localities resulted from the fact that it accidentally escaped infection. Sen. Cappelli (1·5 to 8·7 per cent.) and Garigliano (1·5 to 13·5 per cent.) were also very resistant, as was Timilia in most localities. As durum wheats are not immune from bunt seed should always be treated before sowing.

Moore (M. B.) & Munnecke (D. E.). **High pressure jet inoculation of Wheat and Barley with loose smut.**—*Pap. misc. J. Ser., Minn. agric. Exp. Sta.* 655, 1 p., [? 1950. Mimeographed.]

A simple, rapid method developed at the Minnesota Agricultural Experiment Station of inoculating wheat and barley with loose smut [*Ustilago nuda* and *U. tritici*, respectively: *R.A.M.*, 30, p. 264] consists of squirting the heads when in the susceptible stage with one or more minute, powerful jets of a spore suspension (spores from 250 heads in $4\frac{1}{2}$ gals. water, though weaker concentrations were equally effective). A Meyers Silver Prince wheelbarrow type power sprayer was used at a pressure of 270 lb. per sq. in., and a disk with one or more openings 0·0143 in. (359 μ) in diameter. The head was squirted first from one side and then from the other while supported on the palm of the hand. In a preliminary greenhouse test on wheat, smut developed on 76 per cent. of the 163 plants from seed of heads so inoculated.

Smith (H. C.) & Blair (I. D.). **Wheat powdery mildew investigations.**—*Ann. appl. Biol.*, 37, 4, pp. 570–583, 1950.

In studies at Canterbury Agricultural College, Lincoln, New Zealand, the life-

cycle of *Erysiphe graminis* f. *tritici* [*R.A.M.*, 17, p. 20; 29, p. 16; 30, p. 222] from spore germination to spore formation was found to take six days, and ascospore discharge in the field covered a period of one month. On immune hosts fungal development generally ceased at the point of invasion of cell cytoplasm.

Soil applications of a 0·8 per cent. solution of lithium chloride [ibid., 21, p. 35] in glasshouse seedling experiments and at 56 lb. per acre in a factorial field trial reduced mildew from 11 to 1 and 1·29 to 1·04 per cent. leaf area affected, respectively. There was some evidence that the effects of the lithium in the field were beginning to disappear after 18 weeks.

Race 4 [cf. ibid., 26, p. 386; 28, p. 388] was found in all the New Zealand wheat-growing areas in 1948–9 and race 3 [loc. cit.] in about half. The infection types of both races were recorded on 180 wheat varieties and selections. Fifty-six varieties are completely resistant to both. These include those with Hope H. 44–24, Indian, Kenya, and Pentad parentage. Many varieties susceptible in the early stage were resistant as adult plants. In the New Zealand standard varieties Fife-Tuscan and Dreadnought adult plant resistance is present from about three months after sowing, i.e. it is effective for the period of greatest infection from early spring. Inheritance of adult resistance was demonstrated.

A general conclusion from field trials is that if there is marked growth response from any fertilizer, mildew susceptibility will probably increase for the period of growth response. The cost of application of lithium chloride and silicon is uneconomic. Much could be achieved if there were a practicable means of destroying volunteer plants and wheat stubble and straw in late summer. There exists a wide range of resistant material that can be used in breeding work. Emphasis is laid on the importance of regular surveys in conjunction with any breeding programme in order to detect new races as soon as they occur.

Rui (D.). **Precisazioni ed indagini sul 'nanismo epidemico' del Mais.** [Observations and researches on 'epidemic dwarfing' of Maize.]—*Notiz. Malatt. Piante, 1950*, 12, pp. 35–45, 2 pl., 1950. [Mimeographed.]

Studies carried out during 1949 under the auspices of the Phytopathological Observatory of Veneto showed that maize growing in the province of Verona presented symptoms of 'epidemic dwarfing', which appears to be the prevalent form in Italy, and some signs of 'hereditary dwarfing' [*R.A.M.*, 29, p. 463]. Tables are given showing the measurements of different organs of Wisconsin and U-50 maize plants, healthy and naturally affected by epidemic dwarfing, the differences in the average measurements being expressed graphically. The panicles of affected and healthy Wisconsin were 63 and 45 per cent. aborted, respectively, 21 and 5 per cent. dwarfed, and 16 and 50 per cent. normal. With U-50 the corresponding figures were (dwarfed plants) 72, 28, and 0 per cent. and (healthy) 32, 18, and 50 per cent. No relationship could be established between the presence of the disease and insect infestation; very few aphids were found on affected plants.

Bottomley (R. A.), Christensen (C. M.), & Geddes (W. F.). **Grain storage studies IX. The influence of various temperatures, humidities, and oxygen concentrations on mold growth and biochemical changes in stored yellow Corn.** —*Cereal Chem.*, 27, 4, pp. 271–296, 8 graphs, 1950.

At the Minnesota Agricultural Experiment Station the effects of variations in atmospheric temperature and oxygen concentration on mould growth [cf. *R.A.M.*, 27, p. 417], viability, and several biochemical properties of No. 1 grade yellow dent corn [cf. ibid., 29, p. 41] with 34 per cent. internal kernel infection by *Fusarium* sp., *Aspergillus* sp., and *A. glaucus*, stored for 12 days, were determined in a factorially designed trial. The moisture contents, which were in equilibrium with relative humidities from 75 to 100 per cent., ranged from 17·4 to 31·2 per cent. (dry basis),

the temperature from 25° to 45° C., and the oxygen concentration from 21 to 0·1 per cent.

Mould growth and the biochemical properties of the maize were affected most by the variations in relative humidity and least by the changes in atmospheric composition. The effect of each variable depended on the levels of the others. As the relative humidity of the air in contact with the maize was raised from 75 to 100 per cent., the total mould count increased logarithmically, internal mould infection and fat acidity rose sharply, and the viability of the grain decreased. The highest mould count (121,000,000 per gm.) was recorded at 25° and 100 per cent. relative humidity, and the maximum fat acidity at 40°, while the minimum figures were obtained at 45°. Lowering the oxygen content of the storage atmosphere from 21 to 0·1 per cent. decreased the extent of the several changes, the depression in mould count being four times greater than in fat acidity.

The composition of the microflora varied with moisture, temperature, and oxygen concentration. Maize in equilibrium with a relative humidity of 80 per cent., and over all the atmospheric conditions employed, supported predominantly *Penicillium* sp. at 25°, *A. flavus* at 30°, *A. glaucus* at 35°, and *Mucor* sp. at 45°. *P.* sp. and *Candida pseudotropicalis* were markedly tolerant of low oxygen tensions. Total mould count and fat acidity did not show parallel trends with variations in the storage conditions.

Maize deterioration could not be accurately gauged by measurement of any one of the biochemical changes studied, but the decrease in non-reducing sugar content was the best single index. The values ranged from 0 to 174 mg. sucrose per 10 gm. maize and bore a straight-line relation to relative humidity and to the logarithms of the mould counts for the corresponding samples.

Leukel (R. W.). **Tests of seed treatments on Sorghum seed in 1950.**—*Plant Dis. Reptr*, 34, 11, pp. 342–343, 1950. [Multilithed.]

In further tests in 1950 at the Plant Industry Station, Beltsville, Maryland [cf. *R.A.M.*, 29, p. 96], Texas Blackhull kafir and Leoti sorgo [*Sorghum saccharatum*] were inoculated with covered smut [*Sphacelotheca sorghi*: loc. cit.], treated with 19 different fungicides, and sown one week later in non-sterilized soil at 20° and 25° C. and in the field. Arasan, copper carbonate, phygon, spergon, aagrano 48, semenon, CC 2–224, CC 640, and CC 5400 [ibid., 29, p. 370], all as dusts at 2 oz. per bush., aagrano 250 and dynacide (1 oz.), panogen ($\frac{3}{4}$–$1\frac{1}{4}$ oz.), ceresan M and mercuran A.S. ($\frac{1}{2}$ oz.), and arasan and phygon slurry all gave complete control, the percentage of smutted heads in the untreated ranging from 38 to 50. The three CC dusts were used on kafir only.

Ruggieri (G.). **Il 'mal secco' fra gli Agrumeti di Fondi.** ['Mal secco' in the Citrus groves of Fondi.]—*G. Agric.*, 24, 1947. [Abs. in *Boll. Staz. Pat. veg., Roma*, Ser. 3, 5, pp. 140–141, 1947. (Published 1950.)]

The author records the appearance of citrus 'mal secco' disease [*Deuterophoma tracheiphila*: *R.A.M.*, 28, pp. 422, 626; 29, p. 464] in a new area, Lazio, and discusses this in relation to the importation into this locality of sour orange from an infected region. He advises that sweet orange trees should be planted out after nursery grafting at a very early age on bitter orange not less than two years old. The trees should be pruned annually and all the suckers removed. Growers should make co-operative arrangements to obtain seedlings from unaffected areas.

Fraselle (J. V.). **Experimental evidence of the pathogenicity of Fusarium oxysporum Schl.f. to the Oil Palm (Elaeis guineensis J.).**—*Nature, Lond.*, 167, 4246, p. 447, 1951.

Forty days after washed roots of vigorous oil palm seedlings at the two-leaf stage had been dipped in a diluted culture solution of the strain of *Fusarium oxysporum*

causing wilt of oil palm in Nigeria and the Belgian Congo [*R.A.M.*, 30, p. 156, and cf. next abstract] and planted in pots of sterilized soil, leaf yellowing, desiccation, and browning developed, though uninoculated plants were healthy. Two months after inoculation many of the inoculated seedlings were seriously affected and some were dead. The inoculated plants had both diseased and healthy roots, and necrotic vascular strands could be traced from the roots into the shoot or bulb. On being cultured the necrotic bulb tissue yielded only pure cultures of *F. oxysporum*, though the fungus was seldom obtained alone from diseased roots.

Heim (R.) & Bachy (A.). **Observations préliminaires sur une grave maladie du Palmier à huile sévissant au Congo français.** [Preliminary observations on a serious disease of the Oil Palm rife in the French Congo.]—*C. R. Acad. Sci., Paris*, 228, 3, pp. 217–220, 1949.

The authors describe their preliminary observations on the 'boyomi' disease affecting the extensive oil palm plantations of the French Congo [*R.A.M.*, 29, p. 412], notably in the equatorial region. Besides a condition designated 'orange virosis' and corresponding in symptomatology to Wardlaw's 'plant failure' in the Belgian Congo [ibid., 28, p. 272], which he has provisionally attributed to trace element deficiency, the palms suffer from a widespread necrosis (tracheomycosis) of the rachis (*Fusarium bulbigenum* var. *tracheiphilum* and *Fusarium* spp.) [loc. cit. and cf. preceding abstract]. No correlation could be established between this disease and various fungi causing strictly localized and superficial damage to the rachis or folioles, e.g., *Pestalotia* [*Pestalotiopsis*] *palmarum* [ibid., 28, p. 489], *Cercospora palmicola* and its f. *stilbacea* [ibid., 29, p. 152], and certain sooty moulds. The pathogen is believed to enter through insect punctures. The brownish-black necrosis, originating in the subterminal or more rarely the terminal portion of the rachis, proceeds downwards along the vascular fibres but seldom reaches the base. A mycelium may sometimes be detected in the xylem vessels, inducing a gummous exudation and tyloses of the folioles. The bast, sclerenchyma, and medulla may also be involved.

The virosis+necrosis complex never leads to the death of the palms and would seem, therefore, to be distinct from the wilt in the Belgian Congo. On the other hand, nutrient deficiency cannot be held responsible for the clear-cut symptoms of a virosis, comprising a vivid orange-yellow coloration and reduction of the folioles to the primary veins, so that the trees present an external crown of denuded, frequently dead fronds resembling fish-bones, generally surmounted by a crown of living but golden fronds surrounding an apparently normal terminal plume. Moreover, 'orange virosis' spreads by contact and presents all the features of an infection.

Koba (S.). **A study of Fusarium take-all of Cotton seedlings. I. Patho-oecological observations, and the cause of outbreak of the disease.**—*Ann. phytopath. Soc. Japan*, 11, 4, pp. 186–203, 6 figs., 1 graph, 1942. [Japanese, with English summary. Received November, 1950.]

In Western Chosen 90 per cent. of the cotton seedlings are affected every year by a take-all disease, caused by four species of *Fusarium*, which can be detected only on the roots. The disease is favoured by saturated soils having a minimum temperature below 12° C. Affected seedlings recover readily when the minimum soil temperature rises above 13° and the water content is reduced to 50 per cent. of its capacity. The outbreak in Western Chosen in 1938 is explained by the fall of the minimum daily temperature in the latter half of May to below 5° for several successive days, concomitant with heavy rainfall which saturated the soil and continued until the beginning of June, followed by continuous dry weather and high temperature during the first part of June.

Hutchinson (J. B.), Knight (R. L.), & Pearson (E. O.). **Response of Cotton to leaf-curl disease.**—*Res. Mem. Emp. Cott. Grow. Corp.* 8, 16 pp., 1950.

This article, already noticed [*R.A.M.*, 29, p. 507], is herein published as a separate Memoir.

Summary of regional tests of Cotton seed treatments—1949.—*Plant Dis. Reptr*, 34, 11, pp. 334–337, 1950. [Multilithed.]

In the 1949 regional cotton seed treatment tests, in which 12 workers co-operated, a special evaluation of 14 fungicides on delinted Coker—100 W and Deltapine was made. The percentages of surviving seedlings were significantly higher from treated seed only in North Carolina and Oklahoma. The chemical CC 5400 [*R.A.M.*, 29, p. 370 and above, p. 317] appears to merit further evaluation.

Ainsworth (G. C.). **List of fungi recorded as pathogenic for Man and higher animals in Britain.**—*Trans. Brit. mycol. Soc.*, 32, 3–4, pp. 318–336, 1949.

The census of fungi recorded for Britain taken under the auspices of the British Mycological Society did not include 'medical fungi', which are incorporated in the present useful list [cf. *R.A.M.*, 29, p. 304]. It includes also certain Actinomycetes which tend to be referred to the mycologist. The literature has been searched for records up to the end of 1947.

Note bibliographique sur l'Abacá (Musa textilis, Née). [Bibliographical note on Abacá (*Musa textilis* Née).]—*Coton Fibres trop.*, 4, 2, pp. 57–67, 2 figs., 1 diag., 2 maps, 1949.

This useful compendium of the available information on abacá (*Musa textilis*) includes a section on the following diseases with brief notes: wilt (*Fusarium oxysporum* var. *cubense*) [*R.A.M.*, 24, p. 371]; bunchy top virus [ibid., 27, p. 421]; mosaic [cucumber mosaic virus: ibid., 20, p. 465; 30, p. 39]; anthracnose (*Gloeosporium musarum*) [ibid., 4, p. 350]; a smooth-spored *Pythium* attacking the young shoots, forming 'soap bubble' spots on the leaves, and mostly causing root rot [ibid., 12, p. 383]; and stem rot (*Helminthosporium torulosum*) [ibid., 14, p. 312].

Memoria de la segunda reunión de Lino 31 de Mayo y 1 Junio de 1949 en la Estación Experimental de Oliveros. [Report of the second Flax conference 31st May and 1st June, 1949, at the Experiment Station of Oliveros.] –152 pp., 9 figs., 3 diags., 4 graphs, República Argentina, Ministerio de Agricultura y Ganadería de la Nación, 1949. [Mimeographed.]

This fully documented and tabulated compilation comprises much valuable information on flax diseases in Argentina, with special reference to breeding for resistance. E. F. Godoy and O. Bruni (pp. 4–8) deal with the urgent problem of 'soil sickness', associated with *Fusarium lini*, seven physiologic races of *Rhizoctonia* [*Corticium*] *solani*, and *Pythium ultimum* [*R.A.M.*, 27, p. 412]. The complex, which is most prevalent in Santa Fe, Entre Ríos, and northern Buenos Aires, may originate in the traditional system of monoculture: in many localities flax has been sown in biennial rotation with wheat for periods of 40 to 50 years. To counteract the losses in 'sick' soils an excess of seed must be used, amounting in some cases to 80 or 90 kg. per ha. The development of the variety Charrúa M.A., characterized by an extraordinary degree of resistance to wilt (*F. lini*) [see above pp. 270, 307], represents a notable advance in the phytotechnical field.

In experiments by B. Santini and J. J. Huici (pp. 9–17, 2 graphs) at the Experimental Institute, Sante Fé, seed treatment with uspulun and granosan at the prescribed rates failed to increase yields significantly. The best stands and the lowest wilt percentages were produced by Klein 11 and 330 M.A., with the highest

germinative capacity (98 per cent.) and maximum weight per 1,000 seeds (6,300 and 6,800 gm., respectively), in contradistinction to Querandi M.A. (62 per cent. and 5,620 gm., respectively).

Aurora de M. de Rosbaco (pp. 18–20) describes the results to date of investigations which have been in progress since 1946 in the development of resistance to wilt in heavily infested soil at the Tezanos Pinto Experiment Station, Entre Ríos. Hybrid populations arising from Charrúa M.A., H8–2–10–1–1–1–2, 7223–1, 6962–1, P. 6098, and 6962–2 have given the highest yields and, together with 7528–1 and 7528–4 and the North American CI 975 and CI 479, provided most of the selections for 1947–8. The four last are reputed to be not unduly susceptible to 'pasmo' (*Septoria linicola*) [*Sphaerella linorum*: loc. cit.].

R. Ribeiro (pp. 21–28, 1 graph, 10 plans) discusses and interprets the results of statistical analyses of the reaction to *F. lini* of 11 varieties tested at the 'La Estanzuela' Phytotechnical Institute (Uruguay) in 1946. Charrúa M.A. was the most resistant, followed by Minuano, while some promise was also shown by Tabaré, H 2, and Repetible 117.

In trials by W. F. Kugler and C. V. Marciotte (pp. 29–30) at the Pergamino Experiment Station, Argentina, a group of lines reacted with equal susceptibility to a highly pathogenic physiologic race of *C. solani*. Among the fibre types tested a satisfactory combination of wilt resistance with other desirable characters appears to have been effected in the hybrid H185, while the lines Mapún M.A. and Achay M.A. out-yielded the control variety, Común Chabás, by 42 and 11 per cent., respectively.

E. F. Godoy and O. Bruni (pp. 32–35) report on their studies at the Pergamino Station on various aspects of 'pasmo', epiphytotics of which occurred in the wet seasons of 1943 and 1946, whereas in the dry years of 1944, 1945, 1947, and 1948 the disease was virtually absent. Except in extremely susceptible varieties like Buck 113, the losses due to *S. linorum* are not generally excessive. None of the 21 linseed varieties and selections tested for their reaction to 'pasmo' showed more than a moderate degree of resistance, e.g., the American C.I. 975 (Bison × C.I. 479) and C.I. 479 (C. Pinck) and the Argentine 6808–1, 6808–4, and 7223/40–4. All the five fibre lines were susceptible.

In A. de M. de Rosbaco's experiments (pp. 36–37) on varietal reaction to *S. linorum*, the reputedly resistant C.I. 975 and C.I. 479 proved unable to withstand severe attacks such as that of 1946, at Tezanos Pinto, and the same is true of E2–E3, which has shown resistance at 'La Estanzuela'. Selections of 'pasmo'-free plants are made annually for further trials. In 1946 only 74 could be detected among thousands, while the number of healthy individuals procured for this purpose in 1948–9 was 34. In general, in Entre Ríos the fibre varieties sustain less damage from 'pasmo' than the linseed.

W. F. Kugler and C. V. Marciotte (pp. 38–39) conclude from their experiments at Pergamino that 'pasmo' presents greater difficulties than any other flax disease in the development of resistant varieties. The resistance of C.I. 975 has been maintained and the variety is in use in breeding experiments, together with some selections which survived greenhouse and field inoculation [ibid., 30, p. 229]. F_6 material of the Klein 11 type, combining resistance to *S. linorum* and *F. lini*, is now available for further testing.

E. F. Godoy and O. Bruni (pp. 41–44) present up-to-date information on various aspects of flax rust (*Melampsora lini*) [ibid., 29, p. 354], epiphytotics of which were recorded in 1943 and 1946. In 1948 the disease was widely distributed and virulent in northern Buenos Aires and Entre Ríos. The physiologic races [ibid., 26, p. 489 *et passim*] present in the country are 19, 20, 22, 40, 42, and 42B. In the Pergamino district *M. lini* cannot survive the summer in the uredo state owing to the prevailing high temperatures. Inoculation experiments with the highly pathogenic race

42 resulted in the development of the immune linseed varieties Charrúa M.A. and H8. In 1945 the following fibre lines were segregated in a plot of 584 rust-free selections: 10678, H 96, and H 87, immune from races 19, 22, 40, and 42; and a quasi-immune linseed line, 13927/45. The development of the immune Mapún M.A., Achay M.A., 4980–2, 405–4–1–1, 323–4–2–2, 1186610, H 100, H 184, and H 185 (all fibre lines) was rapidly accomplished by tests on the progeny of every cross and back-cross within the framework of the breeding programme.

A. DE M. DE ROSBACO (pp. 45–46) reports on the programme of breeding for resistance to rust at Tezanos Pinto, where the generally widespread race 19 predominates. Since 1946 the immune linseed varieties Charrúa M.A. and H 8–2–10–1–1–1–2 (both descended from Bombay) [loc. cit.] have been used as parents in hybridization experiments. Of over 200 F_2 selections exposed to the virulent outbreak of 1948 a number were rust-free. In the same year none of 50 fibre lines sent for testing to Castelar and only three of 400 sent to Pergamino proved to be immune.

W. F. KUGLER and C. V. MARCIOTTE (pp. 47–49) describe the work in connexion with breeding flax for resistance to rust at Pergamino. Inoculation experiments carried out during recent years have culminated in the production of a number of linseed and fibre selections immune from races 19, 20, 22, 40, and 42, and effective control of *M. lini* through their distribution is anticipated in the very near future.

FISCHER (C. W.) & KELLER (J. R.). **Stop the rot in flower shipments.**—*Bull. N.Y. St. Flower Grs* 65, pp. 2–3, 8, 6 figs., 1951. [Multilithed.]

In studies carried out at Cornell University, Ithaca, New York, cut carnation flowers sprayed with *Botrytis* [? *cinerea*: *R.A.M.*, 29, p. 154; 30, p. 159] spores were enclosed under bell jars and brominated activated charcoal (BAC), pasted between layers of kraft paper, was suspended over the flowers. After several days at room temperature no mould had developed, though other carnations enclosed without charcoal or with plain activated charcoal decomposed rapidly. Pompon chrysanthemums were inoculated with a suspension of the *Ascochyta* ray blight fungus [*Mycosphaerella ligulicola*: ibid., 30, p. 230] and similarly treated with BAC; rotting was completely controlled, though the untreated flowers broke down rapidly. BAC also appeared to be effective in controlling gladiolus rot due to *Botrytis* sp. and [unspecified] mould developing on raspberries, strawberries, and tomatoes. Carnation flowers previously inoculated with the fungus [*B.* ? *cinerea*] suspension were wrapped in waxed paper, then in paper containing BAC, then placed in a waxed cut-flower box, and kept at 50° F. for two weeks. The treated flowers developed no mould, though untreated flowers similarly packed became worthless. It was found that BAC had to be kept in rather close proximity to the flowers in order to be effective. If it came into direct contact or if the flowers were wet it was toxic. In atmospheres of over 90 per cent. relative humidity BAC appeared to lose effectiveness slowly, though it performed most of its protective function.

Crop results 1950—prospects 1951.—*Bull. N.Y. St. Flower Grs* 65, pp. 4–7, 1951. [Multilithed.]

'Karathane' is stated to have given excellent control of mildew [*Sphaerotheca pannosa*] of greenhouse roses. In New York State carnation bacterial wilt [*Pseudomonas caryophylli* [*R.A.M.*, 28, pp. 8, 334] is becoming more widely distributed and more serious. *Botrytis* on chrysanthemum blooms [*B.* ? *cinerea*: cf. ibid., 29, p. 154] and chrysanthemum ray blight [*Mycosphaerella ligulicola*: see preceding abstract] were both controlled by regular spraying with parzate, beginning before colouring and continuing after the flowers were open.

Sakaguchi (M.). **A sclerotial disease of Narcissus.**—*Ann. phytopath. Soc. Japan*, 11, 3, pp. 114–135, 1 pl., 6 figs., 1 graph, 1941. [Japanese, with English summary. Received November, 1950.]

A sclerotial disease of narcissus in Japan caused by *Sclerotinia gladioli* [*R.A.M.*, 11, p. 786; 13, p. 581; 19, p. 559; cf. 20, p. 467] is characterized by a yellowing of the leaf tips, which gradually spreads all over the plant, and the appearance of sclerotia on the bulb scales. The following year growth is poor and there is premature yellowing of the leaves, the plant finally dying. The spherical or subspherical, black or dark brown sclerotia measured 70 to 80 by 121 to 165 μ on the host. Potato, bean, Saito's soy onion, and Czapek's agars were favourable for mycelial growth and non-sucrose media for sclerotial formation (at 20° C.). The optimum, maximum, and minimum temperatures for mycelial growth were 28°, 32° to 36°, and below 0° [ibid., 7, p. 724]. On potato agar the best mycelial growth was obtained at pH 4·8 and at sucrose concentrations of from 5 to 7 per cent. The pathogen remained viable in test tubes for about two years. The disease was reproduced in narcissus (12 varieties), tulip, onion, and gladiolus by artificial inoculation, especially by the introduction of the fungus into the soil. *S. gladioli* was first recorded in Japan at Yokohama in 1928 on diseased tulip bulbs imported from Holland, and has since then [ibid., 18, p. 506] been intercepted in various parts of the country.

Beaumont (A.). **Observations on Narcissus leaf scorch in south-west England.**—*Ann. appl. Biol.*, 37, 4, pp. 591–596, 1950.

Narcissus leaf scorch (*Stagonospora curtisii*) [*R.A.M.*, 30, p. 160] may appear in south-western England even when bulbs are cleaned and planted in an isolated field which has never grown narcissi before. When bulbs are kept very moist typical mycelium occasionally grows out from the browned tissues of the neck [ibid., 17, p. 42]. Tip lesions develop slowly at the early stage of bulb development, typical leaf scorch, in general, appearing after three to five weeks. In forcing boxes covered with straw primary symptoms are normally visible as soon as the plants are put in the houses at the beginning of December. Secondary infections do not usually begin until mild, showery weather prevails, the great bulk of them occurring in April, when the fungus spreads to the flowers. The exact period in relation to opening of the flower buds may make all the difference between a clean and an unmarketable flower crop. The economic loss from flower spotting is considerable; the disease may also develop on cut flowers in transit. Later in the season premature leaf decay may set in; it is greatest on wet, badly drained soils, and beds three years old or more.

The Polyanthus group is the most susceptible, and most of the *poetaz* varieties are very susceptible. The Barrii group and jonquil hybrids are less so. The disease has been found on wild *Narcissus pseudo-narcissus* plants, the only other host in south-western England being *Amaryllis belladonna*, of which every stock examined was affected.

McWhorter (F. P.) & Brierley (P.). **Anatomical symptoms useful in diagnosis of Lily rosette.**—*Phytopathology*, 41, 1, pp. 66–71, 1 fig., 1951.

In this co-operative study organized by the Plant Industry Station, Beltsville, Maryland, and the Oregon Agricultural Experiment Station, vascular leaf necrosis (principally of the phloem and sheath cells) was found to occur regularly in Easter lily (*Lilium longiflorum*) infected by the lily rosette virus [*R.A.M.*, 28, p. 217]. Occasionally the cells adjoining the sheath and the xylem parenchyma are also involved. These necroses, which are easily demonstrated in freehand sections of living leaves mounted in 0·05 per cent. trypan blue [ibid., 21, pp. 61, 90; 28, p.

438], are not present in the foliage of lilies suffering from other virus diseases. The trypan blue stain, therefore, should provide a rapid method of diagnosing the lily rosette virus.

Pettinari (Carla). **Il mosaico del Garofano in Italia.** [Carnation mosaic in Italy.] —*Notiz. Malatt. Piante, 1950*, 12, pp. 10-11, 1950. [Mimeographed.]

Carnations from San Remo showed indefinite, depressed, chlorotic spots on the youngest internodes of the stem and on the leaves, the normal tissues appearing somewhat swollen. Inoculations of healthy carnations by spreading ground-up affected material on the leaves and stems gave positive results in 22 days. The causal agent is considered to be carnation mosaic virus [*R.A.M.*, 29, p. 563], not previously recorded from Italy.

Thirumalachar (M. J.). **A chytridiaceous parasite of Limnanthemum indicum.**—*Indian Phytopathology*, 2, 2, pp. 128-131, 7 figs., 1949. [Received October, 1950.]

Limnanthemum indicum plants near Bangalore were attacked by an aquatic chytrid causing numerous warty galls on the lower surfaces of the leaves and small yellowish specks on the upper surface. The galls were tuberous, yellowish-white, ranging from 2 to 8 mm. in diameter, and several developed vigorous adventitious roots. When fully developed the galls separated from the leaves, leaving a shot-hole appearance. Resting spores were pale cinnamon-brown, asymmetric, and polygonal, and measured 16 by 27 μ in diameter. On germination in a moist chamber after five or six days a dehiscence lid released zoospores. The pathogen has been designated *Physoderma limnanthemi* n.sp.

Jenkins (Anna E.) & Jehle (R. A.). **Sphaceloma viburni destructive to Snowball in Maryland.**—*Plant Dis. Reptr*, 34, 11, pp. 350–351, 1 fig., 1 map, 1950. [Multilithed.]

In August, 1950, a *Viburnum opulus* var. *roseum* shrub, growing near Pocomoke, Worcester county, Maryland, was heavily attacked by *Sphaceloma viburni* [*R.A.M.*, 26, p. 217]. The distorted, discoloured, and extremely ragged leaves bore numerous greyish spots with brown margins. On the lower leaf surface the spotting appeared as brown discolorations. Small cankers occurred on the young stems. By September only a few leaves remained on the tips of several branches. Another mildly infected plant was found in the same county, and one in Somerset county.

Albrecht (W. A.), Sheldon (V. L.), & Blue (W. G.). **Fairy ring mushrooms make protein-rich grass.**—*Bull. Torrey bot. Cl.*, 78, 1, pp. 83-88, 2 figs., 1951.

The results of analyses made in September, 1948, and May and July, 1949, at the University of Missouri, of the grass of fairy rings caused by *Marasmius oreades* [*R.A.M.*, 25, p. 36] show that the early grass would provide 200 lb. high-grade protein per ton of dry matter and the late grass 290 lb., compared with 140 lb. for non-ring grass. The biochemical processes taking place in the soil beneath cause the production of particular organic compounds from the dead grass roots, with reduction in the carbon-nitrogen ratio and the accompanying modification of the soil-organic matter complex, apparently through its mineralization by other soil microbes, as regards nitrogen and possibly other nutrient elements. All the nine essential amino acids assayed were present in higher quantities in the ring grass. The results suggest also that ash analyses are insufficient to determine the part played by the soil in plant nutrition.

Leukel (R. W.) & Martin (J. H.). **Loose kernel smut of Johnson Grass.**—*Phytopathology*, 40, 12, pp. 1061–1070, 1950.

This is an expanded account of the authors' studies at the Plant Industry Station, Beltsville, Maryland, on the prevalent smut of Johnson grass (*Sorghum halepense*) in the southern United States caused by *Sphacelotheca holci*, a note on which has already appeared [*R.A.M.*, 29, p. 21]. The varieties susceptible to *S. holci* in inoculation experiments were mainly of known or probable feterita origin, the kafirs being immune. Johnson grass is slightly susceptible to *S. cruenta* but apparently immune from *S. sorghi* [cf. ibid., 20, p. 160 and above, p. 317].

Sprague (R.). **Some parasitic fungi on Gramineae, Priest Lake, Idaho.**—*Northw. Sci., Wash.*, 24, 3, pp. 132–136, 1 fig., 1950.

The following records of parasitic fungi collected on grasses in the vicinity of Priest Lake, Idaho, [cf. *R.A.M.*, 29, p. 101] in the summers of 1948 and 1949 represent additions to the known mycoflora of the region and some new species. *Hendersonia culmicola* formed ashy, brown-edged lesions on the leaf margins of *Phalaris arundinacea*. *Septogloeum oxysporum* [ibid., 18, p. 34] produced abundant black spots on *Agrostis alba*. *Ovularia pusilla* was common on *A. alba*, forming elliptical, tawny spots on the leaves, and *O. hordei* occurred on *P. arundinacea*. *Mastigosporium rubricosum* [ibid., 29, p. 551] was responsible for eye spots of *A. alba* and *Dactylis glomerata*. *Scolecotrichum graminis* [ibid., 27, p. 257] was the agent of a widespread leaf streak of *Agropyron repens*, *Bromus carinatus*, *B. vulgaris*, and *D. glomerata*. *Puccinia coronata* caused heavy infection of *Calamagrostis canadensis* and *Phalaris arundinacea*, the latter a new host for the State.

Septoria avenae [*Leptosphaeria avenaria*: ibid., 28, p. 520] was found on *Glyceria occidentalis*, while its f.sp. *triticea* is newly reported for the west on *A. repens*. A species of *Phoma*, probably undescribed, induced a coal-black discoloration of the culms and sheath spots on *Festuca occidentalis*. The black pycnidia range up to 90 μ in diameter and the spermatioid spores measure 4 to 6 by 0·5 to 0·9 μ. There is a paucity of Ustilaginales in the region covered by the survey, even the usually widespread *U. bullata* being limited to scattered plants of *B. tectorum* [cf. ibid., 29, p. 566] in gravelly, open spaces. *Rhynchosporium secalis* [ibid., 29, p. 410] was fairly prevalent on *Phalaris arundinacea*.

Helminthosporium tritici-repentis was found on *A. repens* [ibid., 14, p. 90], a new host in Idaho, in association with *Sclerotium elymi*. *Fusarium nivale* [*Calonectria nivalis*: ibid., 29, p. 255] was present on *Poa annua* in moist, shaded areas.

Maramorosch (K.). **Influence of temperature on incubation and transmission of the wound-tumour virus.**—*Phytopathology*, 40, 12, pp. 1071–1093, 3 diags., 1950.

At the Brooklyn Botanic Garden, New York, the influence of temperature on the incubation and transmission of the wound-tumour [clover big vein] virus [*R.A.M.*, 29, p. 9; 30, p. 214] was studied, using crimson clover as a test plant, with alternating periods of 16 hours of light and 8 of darkness in all the experiments, which involved over 1,300 insect vectors (mostly *Agallia constricta*) and more than 6,000 plants.

The minimum incubation period of the virus in the leafhopper at a temperature range of 25° to 32·5° C. was found to be 13 to 15 days, one of the longest yet reported, while at 16° and 20° it extended over 30 days. At 0° the incubation period was lengthened by a time equivalent to the duration of exposure, and at 37° no transmission to crimson clover occurred. At 16° and 20° transmission was poor, but it returned to normal when the leafhoppers were tested at a suitable temperature. The minimum incubation period at 27·5° of the virus in *Agalliopsis novella*, a less efficient vector, did not differ significantly from that in *Agallia constricta*,

nor was there any difference in this respect between nymphs and adults. The incubation period was, however, longer in the less susceptible old plants than in young ones. Different dilutions of virus from viruliferous leafhoppers resulted in different incubation periods in injected insects. The multiplication of a small quantity of virus would evidently take longer to render the insect infective than that of a rather larger amount. Whether acquired by feeding or injection, the virus persisted in the vector until death.

Sweet clover (*Melilotus* sp.) cuttings taken from clones infected with clover big vein virus for several years gave rise to virus-free plants.

CASTELLANI (E.). **Su alcune virosi delle Leguminose foraggere osservate in provincia di Firenze.** [On some virus diseases of forage legumes observed in the province of Florence.] –*Notiz. Malatt. Piante, 1950*, 12, pp. 1–8, 1 pl., 1950. [Mimeographed.]

Soy-bean mosaic [*R.A.M.*, 29, p. 73] was widely prevalent in experimental soy-bean plots in Florence in 1949. New lines were affected and some, which in previous years had shown only mosaic patterns, developed leaf swellings. In the same plots *Melilotus alba* and *M. officinalis* showed typical mosaic as described from North America [ibid., 12, p. 414] and Germany [ibid., 9, p. 120]. Yellowish, irregular, sparse, interveinal spots appeared on the blades of the leaflets among areas of normal or very dark green, the latter mostly occurring along the veins. In severe cases, especially on *M. alba*, there was slight curling of the leaflets with slight discoloration of the veins. The symptoms were most conspicuous in spring. The growth of affected plants was retarded at first and the leaflets remained small, but later became more normal. Next year the disease reappeared, the virus apparently having overwintered in the roots.

On alsike clover (*Trifolium hybridum*) there were mosaic symptoms agreeing with those of alsike clover mosaic virus [ibid., 19, p. 638]. *T. repens* also showed mosaic symptoms closely resembling those due to pea mottle and pea wilt viruses [ibid., 15, p. 274; 21, p. 293]. A few plants of *M. officinalis* had symptoms of tobacco ring spot virus [ibid., 13, p. 519].

LUCKWILL (L. C.) & CROWDY (S. H.). **Virus diseases of fruit trees. II. Observations on rubbery wood, chat fruit, and mosaic in Apples. Progress Report.**—*Rep. agric. hort. Res. Sta. Bristol, 1949*, pp. 68–79, 1 pl., 1 diag., [? 1950].

The symptoms, varietal host range, and history of apple rubbery wood, chat fruit, mosaic, and flat limb [*R.A.M.*, 30, p. 167] are described and the continuation of investigations [ibid., 24, p. 22] up to the end of 1949 is reported. In March, 1945, at Long Ashton ten 5-year-old Lord Lambourne trees with symptoms of rubbery wood were headed back and grafted with scions of healthy Lambourne from the 'original' trees. Five died, but the remainder were all very rubbery in the autumn of 1946. Healthy scions worked at the same time on to neighbouring non-rubbery trees all made normal growth. Ten Lord Lambourne trees headworked on to Ontario all became rubbery. Two main scaffold branches on each were cut back in March, 1948, and rind-grafted with healthy Lambourne scions from the 'original' trees, one lot being grafted on the Lambourne wood, and the other on to Ontario wood. By the autumn of 1949 all the scions were rubbery. In the spring of 1945 a healthy Bramley bush tree with five main scaffold branches was cut back and four were worked with healthy Lambourne scions from the 'original' trees and the fifth with rubbery scions. During the past four years the disease has spread progressively throughout the tree. By 1949 even the Lambourne scions farthest from the point of infection were affected, though a Bramley shoot allowed to grow from branch 5 remained healthy.

These experiments demonstrate that rubbery wood is graft-transmissible and

may therefore be classed as a virus disease. Further, it can be transmitted through varieties which display no symptoms of the disease. Other evidence, not yet complete, strongly suggests that chat fruit is graft-transmissible. Rubbery wood and mosaic spread naturally, though slowly, in the field, and the same may be true of chat fruit. Healthy Lord Lambourne budded on Malling clonal rootstocks all developed a high percentage of rubbery trees two years after budding, except those on the M. II stock used, which produced completely healthy trees.

Certain apple varieties, tolerant of rubbery wood and chat fruit (including Laxton's Superb, Crawley Beauty, Blenheim Orange, Edward VII, and Monarch), can be successfully headworked on to infected Lord Lambourne trees. Mosaic trees should be destroyed.

Thurston (H. W.). **Use of glyoxalidine derivatives as fruit fungicides.**—*Agric. Chemicals*, 5, 9, pp. 28–31, 99, 1950.

The author summarizes the results of comparative tests of glyoxalidines [see next abstract] and lime-sulphur for the control of apple scab [*Venturia inaequalis*: *R.A.M.*, 25, p. 402; 27, p. 370; 29, p. 367; 30, p. 233] in Pennsylvania and of 2-heptadecyl-glyoxalidine and other fungicides against cherry leaf spot (*Coccomyces hiemalis*) [ibid., 30, p. 172 and above, p. 312] in Pennsylvania, Virginia, and West Virginia from 1942 to 1945. Since 1946 field testing of glyoxalidines as crag 341 c (solution of glyoxalidine acetates in isopropanol) [ibid., 30, p. 52] and fungicide 341 b (30 per cent. by weight mixed glyoxalidine and 3 per cent. 1-hydroxyethyl 2-heptadecyl-glyoxalidine dispersed in kaolin) has continued in most of the principal apple and cherry growing sections of the United States, Canada, and Great Britain. The percentage fruit scab at Pennsylvania State College in 1947 after 341 c at $\frac{1}{2}$ and 1 lb. and lime sulphur at $1\frac{1}{2}$ gals. per 100 gals. was 29, 10, and 14, respectively, on McIntosh and 7, 2, and 3 on Stayman, with 100 and 98 on the unsprayed. In 1948, using 341 c ($\frac{1}{2}$ and $\frac{3}{4}$ lb. per 100 gals.) and lime sulphur plus 341 c ($1\frac{1}{2}$ gals.–$\frac{1}{2}$ lb.) and lime sulphur plus flotation sulphur ($1\frac{1}{2}$ gals.–10 lb.), the percentages were 23, 18, 32, 31, and 9, 6, 10, 6, respectively, compared with 100 per cent. scab for the unsprayed. In 1949 scab control in Illinois, Maine, New Jersey, North Carolina, Pennsylvania, and Western Virginia was best with 341 c (0 to 14 per cent. scab) compared with sulphur (2 to 28), tag 331 at $\frac{1}{2}$ pt. (1 to 21), fermate 2 to 59), and unsprayed (28 to 100).

Cherry leaf drop and leaf spot control in New York State in 1949 with 341 b, copper (cuprok), fermate, and unsprayed was 15, 35, 22, and 66 per cent., respectively.

It is pointed out that glyoxalidine is a protective fungicide and applications must be well timed. There is little toxicological hazard from spray residues on the fruit.

Hilborn (M. T.) & Lathrop (F. H.). **Organic fungicides in the control of Apple scab and European red mite.**—*Phytopathology*, 41, 1, pp. 52–55, 1951.

At the Maine Agricultural Experiment Station two compounds have given very satisfactory combined control of apple scab [*Venturia inaequalis*] and European red mite [*Paratetranychus pilosus*], namely fungicide 341 c [see preceding abstract] and arathane (dinitro capryl phenyl crotonate). In 1947, using a tractor-drawn, high-pressure spray machine fitted with a Highmoor Multiple Nozzle Spray Boom [ibid., 27, p. 529] in a slightly modified form, seven applications of the former material reduced the incidence of fruit scab from 28 to 2·2 per cent., compared with 2·6 per cent. for 341 b [see preceding abstract] and 0·5 per cent. for elemental sulphur, one of the objections to which is its tendency to increase the mite population. With the same equipment in 1948 the scab percentages in the plots sprayed with arathane (1 lb. per 100 gals.), elemental sulphur, and untreated were 4·6, 4·2, and 64, respectively, the corresponding figures in 1949 being 5·6, 9·2, and 42·1.

Loewel (E. L.) & Reich (H.). **Die Ergebnisse unserer diesjährigen Spritzversuche (1949) unter besonderer Berücksichtigung der Bekämpfung von Fusikladium (Venturia inaequalis).** [The results of this year's spraying tests (1949) with special reference to the control of *Fusicladium* (*Venturia inaequalis*).] —*Z. PflKrankh.*, 57, 3–4, pp. 99–106, 1950.

In 1949 apple scab (*Venturia inaequalis*) [*R.A.M.*, 28, p. 460] was extremely severe in north-western Germany, owing to the very wet spring and early summer. The results of tests conducted at the Fruit Experiment Station, Jork, demonstrated that two pre-blossom copper sprays (home-made 2 per cent. Bordeaux and ¾ per cent. copper oxychloride, respectively) followed by four applications of 1 per cent. fuklasin [ibid., 29, p. 37] plus 0·4 per cent. lead arsenate gave the best control (the sprayed trees averaging 45·3 per cent. without fruit infection, 14·6 slight, 30·2 medium, and 9·9 severe). Four fuklasin sprays (the first at 2 per cent., the others at 1 per cent., the last combined with 0·4 per cent. lead arsenate) were also very effective against pear scab [*V. pirina*: ibid., 23, p. 304], giving 92·6 per cent. without infection, 3·7 slight, 2·5 medium, and 1·2 severe, compared with 17·2, 31·4, 31·8, and 19·6 per cent. on the unsprayed. The figures for nirit at the same concentrations were 92·4, 4·3, 1·9, and 1·4 per cent., respectively.

Because of the high prices of the fungicides, many fruit farmers used for post-blossom sprays lime-sulphur plus lead arsenate. In order to make this combination as effective as fuklasin plus lead arsenate, copper preparations at high concentrations must be added, which, however, are injurious to many sensitive varieties. Pomasol [ibid., 29, p. 519] in combination with copper was effective against apple scab, but unsatisfactory against pear scab.

The addition of lead arsenate to all materials tested as post-blossom sprays invariably improved scab control.

Fritzsche (R.) & Stoll (K.). **Einige Bemerkungen zur Korkkrankheit an Äpfeln.** [Some notes on cork disease of Apples.] —*Schweiz. Z. Obst- u. Weinb.*, 60, 1, pp. 3–7, 2 figs., 1951.

During 1950 many apple fruits affected by cork (boron deficiency) [*R.A.M.*, 27, p. 530; 29, p. 314] were examined at the Wädenswil Experiment Station, Switzerland. External cork symptoms were observed in June on young fruits of the varieties Glocken, Berner Rosen, Sauergrauech, Danziger Kant, Beauty of Kent, Jonathan, and Boskoop. In midsummer fruit deformations, with localized internal cork frequently with cavities, were found particularly on Ontario, Jonathan, and Glocken. External and internal symptoms may occur simultaneously. During the late stage of development diffuse cork symptoms were observed in the flesh of the fruits, especially in Glocken [loc. cit.] and Jacob Lebel.

Borax (10 g. per sq. m.) should be applied in January, the total amount per mature tree not exceeding ½ kg.

Refatti (E.). **Un' infezione di 'mal bianco' (Podosphaera leucotricha) delle Pomacee sul Pero.** [An infection of 'mildew' (*Podosphaera leucotricha*) of the Pomaceae on Pear.]—*Notiz. Malatt. Piante, 1950*, 12, pp. 45–49, 1950. [Mimeographed.]

In May, 1950, a few Favorita di Capp pear trees alternating with apples in an orchard some km. north of Lake Como were seriously infected by *Podosphaera leucotricha* [cf. *R.A.M.*, 28, p. 360], not recorded in Italy on pear since Voglino reported (in 1904) that he had found it in 1896 on this host near Castelnuovo d'Asti. In previous years the pears had been healthy, except one tree (leafless in 1950), which had shown vague symptoms. In the spring of 1950 the affected trees had reduced inflorescences, some of which withered but remained attached to the

branch. None of them developed. The leaves at the bases of the spurs developed a marginal necrosis, which spread gradually over the entire surface and caused premature leaf-fall.

Nikolić (V.). **Mycosphaerella sentina Fuckel** и могућност заштите Крушака од заразе. [*Mycosphaerella sentina* Fuckel and the possibility of protecting Pear from infection.] —*Plant Prot., Beograd, 1950*, 1, pp. 66–74, 7 figs., 1 graph, 1950. [English summary.]

To prevent pear leaf spot (*Mycosphaerella sentina*) [*R.A.M.*, 26, pp. 64, 533; 29, p. 570] in Yugoslavia, one 1 per cent. Bordeaux spray should be given at the beginning of May; a second is necessary only in wet seasons. In experiments conducted in 1949 and 1950 mature ascospores were detected at the end of April and beginning of May; the infection period lasted for four to five days, the optimum temperature for germination being about 23° C.

Weaver (L. O.). **Effect of temperature and relative humidity on occurrence of blossom blight of stone fruits.**—*Phytopathology*, 40, 12, pp. 1136–1153, 2 figs., 1 graph, 1950.

In studies under controlled conditions at Cornell University, Ithaca, New York, conidia of *Sclerotinia fructicola* germinated at 5° to 30° C., with an optimum between 15° and 25° [*R.A.M.*, 15, p. 677; 22, p. 145, *et passim*]. At 5° and 10° germination was much more rapid on peach petals (11 to 12 and 6 to 7 hours, respectively) than on glass slides (35 and 18 to 19 in redistilled water and 46 to 48 and 24 to 26, respectively, in tap water). The radial growth of *S. fructicola* on potato dextrose agar was most rapid at 20° to 25° [ibid., 4, p. 508]. Some growth occurred at 30° but none at 35°. The periods required for sporulation [in culture] were ten days at 5°, eight at 10°, three at 15°, and two at 20° and 25°. Conidia germinated on peach petals, stamens, and stigmas at 100 per cent. relative humidity, on stamens and stigmas only at 96 per cent., and on stigmas only at 80 per cent. Maximum radial growth on potato dextrose agar at 25° was made at and above 96 per cent. relative humidity equivalent.

The fungus infected blossoms in a saturated atmosphere within 18 hours at 10°, 8 to 12 at 15°, 11 at 20°, and 5 at 25°. Blossoms contracted blight by way of all the floral organs at 90 per cent. relative humidity. At 80 and 70 per cent. blight developed from infected stigmas only. When inoculation was followed by brief periods in a saturated atmosphere, blight developed from infection of all floral organs except sepals on removal to humidities above 80 per cent. At 70 per cent. relative humidity in the greenhouse blossom blight developed only as a sequel to stamen infection. Open blossoms of both small- and large-flowered peach varieties, the former represented in these tests by South Haven, Golden Jubilee, and Valiant, and the latter by an unnamed seedling, were more liable to infection by *S. fructicola* than unopened buds, which did, however, contract blight at high relative humidities. Exposed stamens and stigmas were also attacked.

The percentage of blossom blight and the loss of young fruit were negligible when five days had elapsed between pollination and inoculation. After calyx abscission uninjured fruits are no longer susceptible to infection. Pedicel infection of individual fruits, however, occurred 11 days after pollination at 90 per cent. relative humidity. Montmorency cherry fruits of the same age were directly invaded from the enclosing calyx.

Harris (W. B.). **Copper deficiency of fruit trees.** —*J. Dep. Agric. S. Aust.*, 54, 6, pp. 277–279, 3 figs., 1951.

Pear trees at Sandy Creek, South Australia, showing symptoms of multiple mineral deficiency responded to spray applications of zinc, copper, and manganese.

Zinc without copper gave some growth response, but was followed by wither-tip [*R.A.M.*, 25, p. 505]. Copper alone arrested wither-tip [cf. ibid., 30, p. 233], but the new growth showed stunting due to zinc deficiency [cf. ibid., 23, p. 491; 24, p. 421]. Zinc and copper together gave good response, but Bordeaux sprays applied up to early November did not maintain the new growth, and leaf scorch, which developed on all the affected trees in January, was most severe on the new growth following copper treatment. Manganese improved the leaf colour of chlorotic trees, but had no effect on growth or wither-tip.

It was concluded that a multiple deficiency involving copper, zinc, and manganese was present, in which copper appeared to be the primary limiting factor for growth. Further work is in progress.

Boyer (C. A.), Lovitt (D. F.), & Cation (D.). **A report on certification of stone fruit nursery stock in Michigan.**—23 pp., 4 figs., Lansing, Michigan Department of Agriculture, 1950.

The authors discuss the problems of production and certification of disease-free fruit stocks in the United States and state that the ideal should be the elimination of all recognized harmful virus diseases from nursery stock. The known facts about the occurrence of these diseases in Michigan are recapitulated; they include the peach yellows group (red suture and little peach), peach rosette mosaic, X-disease of peach and cherry [*R.A.M.*, 26, p. 112; 30, p. 171], cherry yellows [see above, p. 312] and green ring mottle, and prune [plum] dwarf [ibid., 28, p. 20; 29, p. 416]. Indexing for selecting disease free trees is discussed [cf. ibid., 29, pp. 498, 500] with special regard to the relative merits of the different hosts and methods, and a list is given of favourable indexing hosts for the virus diseases poorly expressed on peach. For most of these Napoleon cherry is a useful host. The procedures for nursery certification in Michigan at present are divided into three categories: field inspection, indexing, and heat treatment. In the latter immersion of peach budwood at 122° F. for 5 mins. has proved practical against the peach yellows group and X-disease and is recommended. Source peach trees are required to remain disease-free for two years following budwood selection before the resulting nursery trees may be sold as certified. Seedling peach has been used successfully as an indexing host.

In the Department of Botany and Plant Pathology at Michigan State College, work is being done on the development and distribution of virus-free stone fruit budwood and development of understocks. At present there are few available cherry stocks in the State entirely free from cherry yellows and necrotic ring spot [ibid., 30, p. 277], but Shirofugan and Kwanzan flowering cherries propagated on 500 Mazzard rootstocks potted in the greenhouse and Montmorency sour cherry on 500 Mahaleb rootstocks are ready to be used for indexing. The control work of the Bureau of Plant Industry, State Department of Agriculture, for 1948–9 is given with reference to field inspections, heat treatment, and indexing. Inspection has shown that peach virus diseases have decreased from 1·19 per cent. infected in 1945 to 0·2 per cent. in 1949 following eradication campaigns. A visual survey of sour cherries for cherry yellows virus in Michigan during June, 1949, showed 7·7 per cent. to be infected.

Willison (R. S.). **Virus diseases of fruit trees. I. Some field observations on virus-like symptoms on stone fruit in southern England.**—*Rep. agric. hort. Res. Sta. Bristol, 1949*, pp. 64–67, [? 1950].

During the summer of 1949, an inspection of representative cherry and plum orchards [*R.A.M.*, 30, p. 167, and next abstract] in Kent, Somerset, Herefordshire, and Gloucestershire was carried out to obtain a preliminary estimate of the occurrence, type, and distribution of symptoms of possible virus infections.

In one Herefordshire orchard most of the Frogmore cherry trees had long, narrow leaves, many mottled, with large necrotic spots. Vigour appeared to have been impaired and many of the shoots had died back or were leafless owing to the failure of the lateral buds. Die-back and bare lengths of shoot caused by the death and gummosis of buds and spurs were also present in Noble. The leaves tended to roll up parallel to the midrib. A similar gummosis of Merton Heart, Merton Bounty, and Merton Favourite [ibid., 27, p. 76] was observed in a north Somerset nursery. The early leaves developed interveinal chlorotic and red spotting, followed by necrosis and laceration. The leaves of Ronald's Black at Cranbrook, Kent, were narrow and asymmetrical, with irregular margins, line and mosaic patterns, and necrotic spotting; shoot internodes were short and the fruits pointed and withered. At Owen's Court, Kent, Napoleon trees 25 to 30 years old, reported to have made little growth and been relatively unproductive for several years, showed pronounced mottle and small ring patterns on the leaves.

Different trees of Early Rivers showed a wide range of symptoms. In type (1) there was severe necrotic spotting with shot hole and tattering, accompanied by ring and line patterns on early leaves. The trees appeared to 'recover' by midsummer. The fruit was small and ripened unevenly. In type (2) the leaves were narrow with a fine mosaic or ring pattern. In type (3) conspicuous large, coarse, pale green rings and lines due to vein clearing in localized areas were present. In type (4) some leaves were covered with a fine white speckle or mosaic, while others had large, isolated pale green rings and slight necrotic spotting. In type (5) the leaves were faintly marked with large, finely textured greenish ring and line patterns, usually occurring singly. Type (6) was marked by coarse, well-defined ring and line patterns ranging from yellowish-green through yellow to reddish-brown and accompanied by slight necrosis.

In most orchards plum leaves bore pale or yellowish-green fine lines, sometimes forming irregular 'oak-leaf' patterns but usually rings and irregular patterns between or along the larger veins. This condition was observed on Yellow Pershore, Evesham Wonder, Giant Prune, Pond's Seedling, Purple Pershore, Rivers Early, and Victoria. Variants in the form of irregularly distributed vein-clearing and diffuse mosaic were seen on Pond's Seedling, Purple Pershore, and Wye Cross. A coarse, yellow, banded chlorosis, appearing occasionally as broad lines, but more frequently as 'oak leaf' patterns, occurred on Czar, Diamond, Oullin's Golden Gage, Pond's Seedling, Rivers Early, Victoria, Warwickshire Drooper, and Wye Cross. In one north Somerset planting Monarch showed mottling and an irregular, blotchy chlorosis, with premature leaf drop; the affected trees were spindly and straggling. A yellow mosaic affected at least one Belle de Louvain tree growing next to an apple tree with mosaic [virus: see above, p. 325] in an orchard in Kent.

In several glasshouses where peaches were growing on plum rootstocks several types of line, ring, and mosaic patterns were common.

It is probable that some of the incompatibility phenomena are manifestations of virosis and, if this is so, the rootstock problem stands in need of review.

Crowdy (S. H.) & Luckwill (L. C.). **Virus diseases of fruit trees. III. A preliminary note on stunt of Plums.**—*Rep. agric. hort. Res. Sta. Bristol, 1949*, pp. 80–81, 1 pl. (facing p. 79), [? 1950].

During the past two years plum trees severely affected by stunt [see preceding abstract] have been noticed in widely scattered orchards in the west Midlands and southern England. The development of the top is poor, the branches and twigs lack rigidity, and the crown is flat; there is little extension of the branches. The leaves are produced later than on healthy trees of the same variety. The total crop is greatly reduced owing to the small size of the trees. The outline of the woody cylinder is wavy.

Seedling peaches and the cherry rootstock F. 12/1 budded with affected Bountiful and Giant Prune plum scions developed characteristic symptoms the following season. In addition to the varieties previously noted [*R.A.M.*, 30, p. 167] Thames Cross has also shown stunt symptoms.

Byrde (R. J. W.). **Experiments on the control of brown rot of fruits : progress report 1948–49.**—*Rep. agric. hort. Res. Sta. Bristol, 1949*, pp. 81–89, 2 graphs, [? 1950].

In laboratory spore germination tests with seven fungicides the provisional mean ED-50 values in μgm. per sq. cm. against *Sclerotinia fructigena* [*R.A.M.*, 29, p. 102; 30, p. 168] were: phenyl mercury chloride, 0·0074; phygon XL, 0·03; 8-hydroxyquinoline sulphate, 0·058; copper 8-quinolinolate, 0·074; Bordeaux mixture (as copper), 0·21; experimental fungicide 341 c [see above, p. 326], 0·33; and lime-sulphur, 1·05.

In a test on 15-year-old standard Victoria plum trees mummified plums bearing spore pustules of *S. fructigena* were hung on the trees one day before spraying. Brown rot infection of current-season plums was markedly reduced by a late June application of 0·0035 per cent. phenyl mercury chloride, 0·1 per cent. phygon XL, and 0·1 per cent. copper 8-quinolinolate, which gave, respectively, 0·37, 0·12, and 0·87 per cent. infection, as against 3·25 per cent. for the unsprayed. Phenyl mercury chloride produced slight brown necrotic spotting at the base of each fruit, and phygon XL caused considerable damage in the form of dark brown necrotic spots over the entire fruit.

Experiments with eradicant fungicides against detached mummified plums infected with *S. fructigena* confirmed the effective inhibition of spore formation by phenyl mercury chloride and sodium and calcium arsenites, all of which when used at 0·3 per cent. would inhibit sporulation by about 95 per cent. Sodium dinitrol-cresol (elgetol) and sodium pentachlorophenate showed promise as winter treatments.

Pont (W.). **Brown rot control experiments in the Stanthorpe District, 1948–49 and 1949–50.**—*Qd agric. J.*, 71, 5, pp. 265–268, 1950.

In spraying tests carried out in Queensland against brown rot of stone fruits (*Sclerotinia fructicola*) [*R.A.M.*, 15, p. 103; 28, pp. 378, 446; 29, p. 107; 30, pp. 47, 175] Goldmine nectarines were sprayed with lime-sulphur and wettable sulphur (1 lb. to 20 gals.) [ibid., 30, p. 173] in a long schedule (fortnightly applications from mid-November to harvest) and a short (fortnightly, from mid-December). The lime-sulphur plus agral 2 spreader was used at 1–80 during November and 1–120 in December and January.

In 1948–9 the amount of infected fruit sprayed with lime-sulphur (long and short schedules) and with wettable sulphur (long and short schedules) was, respectively, 1·2, 10, 6·8, and 8·7 per cent. as against 13·4 per cent. for the unsprayed, while in 1949–50 the corresponding figures were 6, 26·5, 21·4, 10·3, and 42·5 per cent. The low figure of 10·3 was due to masking by black mould rot (*Rhizopus nigricans*) [*R. stolonifer*].

In 1949–50 plums and peaches were sprayed with lime-sulphur in long and short schedules and at two strengths, viz. (1) 1–80 in November and 1–100 in December and January, and (2) 1 in 100 in November and 1 in 120 in December and January. On Pond's Seedling plum the infected fruits resulting from the long strong, short strong, long weak, and short weak schedules were, respectively, 10·6, 16·7, 17·5, and 19 per cent. as against 26·5 per cent. for the unsprayed; on Late Crawford peaches the corresponding figures were 13·1, 18·6, 12·1, 12·3, and 29·7 per cent., and on Golden Queen peaches, 62·5, 55·6, 60·8, 72, and 67 per cent.

The results show that until a more suitable fungicide for brown rot control has been found little change can be made in the recommendations for treatment [cf. ibid., 27, p. 139]. Orchard sanitation should be a primary consideration. The lime-sulphur 1–15 or Bordeaux 6–4–40 sprays usually applied at bud movement against rust [*Puccinia pruni-spinosae*: cf. ibid., 29, p. 515] and leaf curl [*Taphrina deformans*: cf. ibid., 29, p. 497] should be supplemented by a schedule corresponding to the long, strong lime-sulphur one used in these experiments.

June (R. I.). **Verticillium wilt of stone fruit.** *-N.Z.J. Agric.*, 81, 4, pp. 307–308, 1 fig., 1950.

Outbreaks of *Verticillium* wilt (*V. dahliae*) [*R.A.M.*, 28, p. 68; 30, p. 20] have been reported from the Hawkes Bay district, New Zealand, on apricot, plum, and peach trees, the latter, particularly, being affected. The disease was most severe in young trees (one to eight years old). The most seriously affected peach trees were in a young orchard where tomatoes had been grown previously [ibid., 29, p. 233]. It is recommended that stone fruits should not be grown after tomatoes or potatoes for at least three or four years and the plots kept free from weeds. Where infection has already occurred the soil should not be allowed to become too dry. Badly affected trees should be removed, and the soil sterilized [loc. cit.] before replanting with susceptible plants (not before four years).

Strawberry disease prevented by quarantine vigilance.—*Agric. Gaz. N.S.W.*, 61, 11, p. 568, 1950.

Strawberry dwarf, crimp, or cauliflower disease [*Corynebacterium fascians*: *R.A.M.*, 11, p. 250; 21, p. 282], not present in New South Wales, was found recently by quarantine officers on plants imported into the State from England.

Wilhelm (S.) & Thomas (H. E.). **Verticillium wilt of Bramble fruits with special reference to Rubus ursinus derivatives.**—*Phytopathology*, 40, 12, pp. 1103–1110, 2 figs., 1950.

One of the most destructive diseases of bramble plants in California is the wilt caused by *Verticillium albo-atrum* [*R.A.M.*, 10, p. 757; 16, p. 192; 30, p. 121], the heaviest losses occurring in the coastal counties in years when a prolonged, cool or overcast growing season is followed by an abrupt onset of hot weather. The most conspicuous symptoms are the wilting and defoliation of the first-year shoots, killing of the second-year shoots at the time of fruit-ripening, with resultant loss of crop, and death of canes during the winter. Boysenberry and other horticultural varieties deriving from the Pacific Coast trailing blackberry (*Rubus ursinus*), such as Nectar and Young, are susceptible to *V. albo-atrum*, whereas loganberry and Mammoth are resistant. *R. procerus*, *R. laciniatus*, *R. ulmifolius* var. *inermis*, and probably *R. procumbens* are resistant, while *R. parviflorus* and the Crandall blackberry (*R. allegheniensis*) [ibid., 29, p. 448] are susceptible. Boysenberry, Nectar, and Young seedlings segregate for susceptibility and resistance. Loganberry apparently breeds true for resistance.

Tomato crops build up soil infestation with *V. albo-atrum* [see above, p. 292], the percentage of infection rising progressively in successive plantings, e.g., 1 to 12 in the first, 18 to 75 in the second, and 75 to 96 in the third.

Smith (M. A.) & Ramsey (G. B.). **Bacterial fruitlet brown rot of Mexican Pineapple.** —*Phytopathology*, 40, 12, pp. 1132–1135, 1 fig., 1950.

Specimens of pineapples affected by a brown rot of the fruitlets were received from Mexico at the University of Chicago laboratory in August, 1939. Isolations from diseased material consistently yielded primuline-yellow bacteria, some of

which were inoculated into Cuban pineapples with positive results. The morphological, biochemical, and physiological characters of the pathogen agreed in all essential respects with those of *Erwinia ananas* [*R.A.M.*, 29, p. 160], reported by Serrano as the agent of a similar disease of pineapples in the Philippines [ibid., 7, p. 794]. This is believed to be the first record of the fruitlet rot in North America.

Insecticides and fungicides for the nurseryman and the Mushroom grower.—64 pp., 4 pl., Wheathampstead, The Murphy Chemical Co., Ltd., 1950.

This completely revised edition of the Nurseryman's Booklet includes the latest materials used in spray programmes for the control of the pests and principal diseases of fruit, flowers, vegetables, trees, and shrubs (arranged under hosts). Details are given of the properties and use of each product. Warm water treatments are described on p. 38 and soil sterilization on pp. 58–60.

Engelhard (H.), Müller (O.), & Bertl (K.). **Konstitution und germostatische Wirkung bei Penicillium glaucum.** [Constitution and germostatic action on *Penicillium glaucum*.]—*Zbl. Bakt.*, Abt. 1 (Orig.), 153, 8, pp. 326–335, 1949. [Russian, English, and French summaries.]

From the results of this fully tabulated survey of experiments at the Institute of Hygiene, University of Göttingen, it appears that the toxicity of aliphatic compounds to the spores of '*Penicillium glaucum*' [*R.A.M.*, 29, p, 574] is conditioned principally by their surface activity. Of decisive significance among aromatic compounds are those active groups having as their leading characteristic a double linkage in the side chain in close affinity to a hetero-atom or -group.

Adams (A. M.). **A comparative study of ascospore formation by 43 yeast cultures.**—*Canad. J. Res.*, Sect. F, 28, 11, pp. 413–416, 1950.

In studies at the McMaster University, Hamilton, Ontario, a medium prepared by dissolving 0·04 per cent. dextrose and 0·14 per cent. anhydrous sodium acetate in distilled water and adding 2 per cent. agar was the most favourable of three media tested for ascospore production by various yeasts.

Catálogo de cultivos del Instituto de Microbiología Agrícola. Suplemento del catálogo de cultivos del Instituto de Microbiología Agrícola. [List of cultures of the Institute of Agricultural Microbiology. Supplement to the list of cultures of the Institute of Agricultural Microbiology.]—*Publ. misc. Minist. Agric., B. Aires*, 1, 28 pp., 1948; 2, 6 pp., 1949. [Mimeographed.]

These lists of cultures (which are available for exchange or purchase) in the culture collection of the Institute of Agricultural Microbiology, Buenos Aires, comprise, besides numerous bacteria and yeasts, 30 species of *Aspergillus*, 17 of *Penicillium*, and various other fungi.

Skinner (F. A.). **Preparation of standardized Actinomycete colonies.**—*Nature, Lond.*, 166, 4216, p. 314, 1950.

A method was developed at Rothamsted Experimental Station, Harpenden, for producing standardized actinomycete colonies 5 to 10 mm. in diameter when 3 to 5 days old, in order to compare their anti-fungal activity on different media. Short, open-ended porcelain cylinders heated to 100° to 110° C. and placed end-on to an agar surface sank to a depth of about 0·2 mm. One or two drops of inoculum were placed in the cup so formed. After 48 to 72 hours' incubation, when all traces of surface moisture near the base of the cup had disappeared, the plates were inverted, and a sharp tap on the underside was sufficient to dislodge the cylinder.

Neat circular colonies were left in the required positions on the agar surface ready for the test inocula.

AYTOUN (R. S. C.). **A method of controlling fungal spores or mycelium during treatment with liquids.**—*Nature, Lond.*, 167, 4245, pp. 411–412, 1951.

In a method developed in the Department of Mycology, Edinburgh University, fungus spores were embedded in small pieces of unglazed paper (with a small hole punched near one end for manipulation) previously sterilized by dry heat for 1 hr. at 150° C. and transferred to a sterile Petri dish. A small mass of conidia or spores was ground firmly into the unpunched end of the paper with a glass rod, using a circular movement and firm pressure. Spores not held firmly by the paper fibres were dislodged by swirling the paper vigorously in a flask of sterile water. The piece carrying the spores may then be transferred to the liquid or fungicide being tested, washed, placed on a medium, and incubated to observe germination.

For the manipulation of fungus mycelia, several of the above slips of sterilized paper were laid on the medium in a Petri dish radially around the fungus inoculum. When the hyphae had grown among the fibres of the papers they could be lifted out bearing a quantity of the growing mycelium.

BRIAN (P. W.), WRIGHT (JOYCE M.), STUBBS (J.), & WAY (AUDREY M.). **Uptake of antibiotic metabolites of soil micro-organisms by plants.**—*Nature, Lond.*, 167, 4244, pp. 347–349, 1951.

In co-operative studies at the Butterwick Research Laboratories, Welwyn, and the Hawthorndale Laboratories, Bracknell, of Imperial Chemical Industries, griseofulvin [*R.A.M.*, 28, p. 475] was selected as the test antibiotic as it can be detected specifically and in low concentration by a bio-assay based on its unique effect on the morphogenesis of some fungi; it remains stable in aqueous solutions and more stable in soil than many other antibiotics; it is remarkably persistent in sterile and certain acid soils; and shows little toxicity to higher plants. In preliminary experiments griseofulvin was detected in 7 to 14 days in the upper leaves of cut shoots of several plant species placed in a 10 or 100 μgm./ml. aqueous solution. Established lettuce seedlings grown for four weeks in 10 μgm. solution developed root stunting but little other damage. In a 50 μgm. solution, however, both the roots and shoots were stunted. Griseofulvin was detected in the leaves of the seedlings grown in the antibiotic solutions but not in the controls. Seven days after oat seedlings had been placed in griseofulvin solutions at the above strengths or in soil watered with a 50 μgm. solution, the antibiotic was detected in the guttation-fluid at a concentration of 0·1 to 1 μgm./ml. and continued to appear in the drops for a further three to four weeks after the plants had been washed and changed to a nutrient solution without griseofulvin.

In preliminary experiments to determine whether griseofulvin introduced into a growing plant would confer resistance to fungus parasites, lettuce seedlings were grown in a 10 or 20 μgm. griseofulvin solution for 8 and 14 days. They were then sprayed with a spore suspension of *Botrytis cinerea* isolated from diseased lettuce and incubated in a humid atmosphere for 48 hours. Two weeks later plants without griseofulvin were all infected and most of them dead, but at least 60 per cent. of those with it were free from infection. Best of All tomato plants in nutrient sand culture were watered daily for four days with 50 ml. of either a dispersion or solution of 500 μgm./ml. griseofulvin in 2 per cent. aqueous acetone or with tap water. On the fifth day they were atomized with an aqueous suspension of *Alternaria solani* spores and incubated at 98 to 100 per cent. relative humidity for 24 hours. Two days later minute watersoaked pin-points of infection developed on the treated plants while the control plants showed an average of 1,250 normal, brown, somewhat angular lesions. The experiment was repeated three times with analogous results. No

further development of the initial points of infection occurred on the treated plants during a further week in the greenhouse. They were then repotted in fresh sand and re-inoculated with *A. solani* four days later. The subsequent development of normal lesions indicated that the period of complete protection afforded by the griseofulvin treatment was less than 14 days. Although some normal lesions developed on plants treated with a 100 μgm./ml. solution the latter gave 74 per cent. control of the disease. None of the antibiotic treatments affected the vigour of the plants.

Experiments designed to determine whether griseofulvin could be produced by microbiological synthesis in the soil [ibid., 29, p. 373] and then pass into plants proved inconclusive. The results indicated, however, that a crude soil/maize meal or similar culture of *Penicillium nigricans* or *P. griseofulvum* [loc. cit.] is sufficient to secure the systemic distribution of griseofulvin in plants.

DARPOUX (H.), FAIVRE-AMIOT (A.), & ROUX (L.). **Sur un nouvel antibiotique, l'alternarine, et sur quelques autres substances extraites de cultures d'une souche d'Alternaria solani.** [On a new antibiotic, alternarine, and some other substances extracted from cultures of a strain of *Alternaria solani*.]—*C. R. Acad. Sci., Paris*, 230, pp. 993–995, 1950.

From cultures of a strain of *Alternaria solani* the authors obtained an extract with antibiotic properties, the purified active principle of which they propose to name 'alternarine'. This substance, crystallizing in white needles, was active against a number of bacteria and fungi, including *Bacillus subtilis*, *Pseudomonas medicaginis*, *P. mori*, *Xanthomonas phaseoli*, *P.* [*X.*] *malvacearum*, *X. campestris*, *Agrobacterium* [*Bacterium*] *tumefaciens*, *Penicillium claviforme*, *P. chrysogenum*, and *Botrytis allii* [cf. *R.A.M.*, 28, p. 636].

FLOREY (H. W.), CHAIN (E.), HEATLEY (N. G.), JENNINGS (M. A.), SANDERS (A. G.), ABRAHAM (E. P.), & FLOREY (M[ARY] E.). **Antibiotics. A survey of penicillin, streptomycin, and other antimicrobial substances from fungi, actinomycetes, bacteria, and plants. Volume I.**—xv+628 pp., 89 figs. **Volume II.**—vii+1774 pp., 266 figs., London, Oxford University Press, 1949. £8. 8*s*.

This important treatise (one of the Oxford Medical Publications) on antibiotics [*R.A.M.*, 26, pp. 23, 556; 29, p. 270, and next abstract], with special reference to historical foundations and including accounts of the chemical, biological, and clinical aspects of recent investigations, is concerned for the most part with laboratory investigations. Subjects of mycological interest occur principally in the following sections of Volume I: Part one. Chapter I. Historical introduction. Part three. Antibiotics from fungi. 1. General considerations. Chapter 6. Review of species examined. Part four. Antibiotics from fungi. 2. Substances produced by Fungi Imperfecti and Ascomycetes. Chapter 8. Substances produced by Basidiomycetes, Phycomycetes, and unidentified fungi. Part five. Antibiotics from actinomycetes. Chapter 9. Substances other than streptomycin.

Parts eight and nine in Volume II deal with penicillin (chapters 15 to 40) and streptomycin (chapters 41 to 46), respectively. Chapter 15 is an historical survey and chapter 16 is entitled 'Penicillin-producing fungi'. The bibliography covers pp. 1579–1662.

PRATT (R.) & DUFRÉNOY (J.). **Antibiotics.**—xi+255 pp., 2 pl., 18 diags., 43 graphs, Philadelphia, London, Montreal, J. B. Lippincott Company, 1949. 40*s*.

The authors have endeavoured 'to present in a succinct, integrated plan the facts and principles of fundamental and permanent value relating to antibiotics' [see preceding abstract]. Much of this information is widely scattered in thousands

of publications. Some is derived from the authors' own researches in this field published over a period of years. The 12 chapters deal, respectively, with the concept of antibiotics, biologic significance of fields of diffusion, industrial production and control of antibiotics, the concept of antibiotic spectra, penicillin, streptomycin, chloromycetin and aureomycin [loc. cit.], polymyxin [*R.A.M.*, 30, p. 281], tyrothricin, other antibiotics, mechanisms of antibiotic action, and retrospects and prospects. Lists of references are appended to most of the chapters.

Peracetic acid cuts mold on Tomatoes.—*Food Packer*, 31, 7, pp. 24–25, 2 figs., 1950.

The information here presented is summarized from a paper submitted by F. P. Greenspan and D. G. Mackellar to the recent decennial conference of the Institute of Food Technologists. In preliminary laboratory tests peracetic [peroxyacetic] acid, a newly discovered bactericide-fungicide (Buffalo Electro-Chemical Company, Inc.), has proved very effective against several micro-organisms [cf. *R.A.M.*, 30, p. 183]. Field experiments have shown it to be most useful as a sterilizing wash for fruits and vegetables before processing [cf. ibid., 30, p. 113], as well as for equipment.

Pilot-plant-scale experiments on ½-bush. baskets of tomatoes demonstrated excellent control of mould (including *Fusarium*) for up to three days. In commercial tests in a western New York cannery 17 tons of tomatoes in baskets, tiered three high, were sprayed with a solution of 0·3 per cent. peracetic acid and 0·05 per cent. nacconal, using a power sprayer with a boom. A four-second per basket spray conferred adequate coverage on the fruits. After standing for 1½ days in hot, damp weather an abundance of mould hyphae and deterioration developed in untreated baskets. The treated showed little or no change. In 12 treated and untreated baskets, separately processed in pilot-scale equipment (without trimming), the mould counts by the Howard method [ibid., 16, p. 536] were 22 and 48, respectively. Where advantage was taken of this lower mould population of the treated samples to reduce trimming, a striking increase in product yield (21,850 lb. juice as compared with 20,000) was obtained with a slightly lower mould count than in the controls (15 as against 17).

The germicidal action of peracetic acid is transient, being followed shortly after application by decomposition into acetic acid and water. Pilot plant tests with the compound for the control of mould spoilage on Concord grapes are reported to have been highly successful.

Bade (O.). **Kjemikaliebehandling av tremasse for å hindre soppskader.** [Chemical treatment of wood pulp to prevent fungal damage.]—*Norsk Skogind.*, 2, 8, pp. 223–227, 3 figs., 1948. [English summary.]

In experiments initiated in 1946 at the Norwegian Pulp and Paper Research Institute, Oslo, on the control of fungal damage (mildew and rot) in wet mechanical pulp, fibrosan [*R.A.M.*, 29, p. 445], lignasan, pulpasan, puratized SC, and santobrite were added to the 50 per cent. air-dry mass during pressure at dosages corresponding to an outlay of Kr. 5 and Kr. 2 per ton. The results were very satisfactory, especially with the higher concentration, but the use of all the chemicals except puratized SC is open to grave objections, the odour of santobrite (a phenolic compound) being unduly strong and the toxicity of fibrosan, lignasan, and pulpasan (all ethyl mercury) excessive for the purpose in view.

Siu (R. G. H.) & Mandels (G. R.). **Rapid method for determining mildew susceptibility of materials and disinfecting activity of compounds.**—*Text. Res. J.*, 20, 7, pp. 516–518, 1 diag., 1950.

The information presented in this paper has already been noticed from another source [*R.A.M.*, 30, p. 182].